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SMITHSONIAN INSTITUTION

UNITED STATES NATIONAL MUSEUM

Bulletin 100

VOLUME 14

CONTRIBUTIONS TO THE BIOLOGY OF THE PHILIPPINE ARCHIPELAGO AND ADJACENT REGIONS

PAPERS ON ECHINOIDEA, FISHES, AND COPEPODA

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The scientific publications of the United States National Museum include two series, *Proceedings of the United States National Museum* and *United States National Museum Bulletin*.

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The present work forms No. 100, Volume 14, of the *Bulletin* series.

Frank A. Taylor,
Director, United States National Museum.

EPOSI

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With this volume of contributions to the biology of the Philippine Archipelago and adjacent regions, United States National Museum Bulletin 100 is closed. Further contributions will appear as volumes in the *Bulletin* series or as papers in the *Proceedings of United States National Museum.*

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By
THEODOR MORTENSEN

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By Theodor Mortensen

INTRODUCTION

The first part of the report on the Echinoidea of the *Albatross* Philippine Expedition,[1] published in 1927, dealt with the family Cidaridae. The present second part is concerned with the families Echinothuridae, Saleniidae, Arbaciidae, Aspidodiadematidae, Micropygidae, Diadematidae, Pedinidae, Temnopleuridae, Toxopneustidae, and Echinometridae.

The Echinothuridae are represented in the collection by 16 species and 2 varieties, and there are in addition a couple of young specimens of *Sperosoma* not indentifiable with certainty as to species. The Saleniidae are represented by only one species with a variety, and the Arbaciidae by 4 species. The Aspidodiadematidae are represented by 3 species, the Micropygidae by 2, the Diadematidae by 7, the Pedinidae by 2, the Temnopleuridae by 15 (with in addition 2 unidentifiable tests), the Toxopneustidae by 2, and the Echinometridae by 8.

Of the Echinothuridae, four represent new species, one of these being the type of a new genus, *Hemiphormosoma;* also, there are two new varieties. These were briefly described by me in 1934.[2] A new variety in the Saleniidae found in the collection was described at the same time.

There are described herein four new species, one in the Diadematidae (*Eremopyga debilis*), one in the Pedinidae (*Caenopedina annulata*), one in the Temnopleuridae (*Microcyphus excentricus*), and one in the Echinometridae (*Echinostrephus formosus*).

[1] U. S. Nat. Mus. Bull. 100, vol. 6, pt. 4, pp. 243–312, 22 figs., 33 pls., 1927.
[2] Vid. Medd. Dansk Naturh. Foren., vol. 98, pp. 162–164, 1934.

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Of particular importance are *Hemiphormosoma paucispinum* and *Paraphormosoma alternans*, both representing new generic types related to *Phormosoma* and necessitating the establishment of a separate subfamily, the Phormosominae, for this group of genera, the other genera forming another subfamily, the Asthenosominae. A third subfamily, the Kamptosominae, is not represented in the present collection.

A rather extraordinary fact relating to the biology of the deep-sea echinothurids was substantiated by a study of this material, together with that collected by myself south of Mindanao in 1914, and that is, that most of them are plant-feeders. The contents of their alimentary canal consists almost exclusively of small bits of plants, looking, indeed, like chaff; and it is not algae, but the remains of land plants. This sounds rather paradoxical—deep-sea animals feeding on land plants! But the explanation is not difficult. In areas with a luxurient tropical vegetation, like the Philippines, a large quantity of plant material is carried out to sea and after drifting around for some time ultimately sinks to the bottom and thus provides food for such bottom organisms as prefer this kind of nourishment. That it may be quite a considerable quantity of plant material that thus sinks to the bottom I have myself had the opportunity of observing through the medium of some trawlings off the southern coast of Mindanao, the mud contained in the trawl consisting largely of decaying vegetable matter.

Not all the deep-sea echinothurids are vegetarians. Thus specimens of *Phormosoma bursarium*, taken in the same haul with *Hygrosoma luculentum*, had only pure mud in the intestinal canal, whereas the Hygrosomas had their intestines filled with plant material. This is the more remarkable since the sharp, pointed teeth of *Phormosoma* would seem poorly adapted for mud eating.

The imbrication of the plates of the echinothurids, combined with their mostly very delicate structure and the great size attained by most of these deep-sea echinoids, results in the deplorable fact that they are as a rule very poorly preserved—flattened like a pancake and very often torn to pieces—thus giving a very poor idea of what these sea-urchins really look like. Having for a long time deplored this fact, I conceived the idea that it might, by carefully stuffing them, be possible to make them assume, at least to some degree, their natural shape. The idea proved a decided success, and I succeeded in making even hopelessly torn individuals assume a tolerably good shape. Such stuffed specimens will retain their form equally well in alcohol or in a dried condition.

The number of species of echinothurids known from the Malayan seas is very considerable—21 out of a total number of about 50. A

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comparison with the West Indian seas, from which we know altogether only five species, shows strikingly that in regard to the echinothurids, as with the cidarids, the Malayan region is extraordinarily rich, probably the richest in the world.

With regard to the saleniids there is no such preponderance, the few surviving representatives of this formerly so flourishing group being about equally richly—or poorly—represented in the Indo-Pacific and Atlantic areas.

Of the arbaciids, the few small deep-sea forms known are rather equally distributed, like the saleniids. But out of the nine species of the large and splendid *Coelopleurus* type, the Malayan region with four species as contrasted with only one in the West Indies stands as the richest region. As a small compensation for this relative poverty of the Atlantic area stands the fact that the genus *Arbacia* is confined exclusively to the Atlantic region and the west coast of America, no representative of this genus, or of the related genus *Tetrapygus*, being found anywhere in the Indo-Pacific region. Statements in the older literature of the occurrence of species of *Arbacia* or of *Tetrapygus* in the Indo-Pacific, as for instance at Zamboanga, are all erroneous, based upon old and unreliable labels. Also in the material sent me from the United States National Museum there is a specimen of *Tetrapygus niger* labeled "Philippines; G. B. Steere; Acc. No. 39067." That the label is wrong is beyond doubt.

I am under the greatest obligation to Dr. Alexander Wetmore, in charge of the National Museum, for permitting me to include in volume 2 of my Monograph of the Echinoidea descriptions and illustrations of various new forms in the families herein dealt with that were found in the *Albatross* collection. If I had had to wait for the publication of this part of the *Albatross* report before I could deal with these forms in the Monograph, it would have delayed the publication of the Monograph very considerably. From a scientific point of view also it is more satisfactory to have the full descriptions and the figures of the various new forms from the *Albatross* collection in the right systematic place in the Monograph, instead of mere references to the *Albatross* report. Now I may in the main restrict the mention of the new forms in the *Albatross* report to references to the Monograph.

It may be taken as a matter of course that all the material representing already known species contained in the *Albatross* collection has been made use of in working out that Monograph, it being of the greatest importance to have that work based upon as extensive material as possible.

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Order LEPIDOCENTROIDA

The reasons for uniting the echinothurids with the lepidocentrids in a single order, the Lepidocentroida, are given in the Monograph of the Echinoidea, vol. 2, pp. 114–121.

Family ECHINOTHURIDAE

Subfamily PHORMOSOMINAE

Genus PHORMOSOMA Wyville Thomson

PHORMOSOMA BURSARIUM A. Agassiz

Phormosoma bursarium A. AGASSIZ, *Challenger* Reports, Zoology, vol. 3, pt. 9, Echinoidea, p. 96, pl. 10, b, 1881.—MORTENSEN, Monograph of the Echinoidea, vol. 2, p. 135, pl. 2, fig. 20; pl. 3, figs. 1, 2; pl. 74, figs. 11–15, 1935.

Phormosoma indicum DÖDERLEIN, Wiss. Ergebn. Tiefsee-Exped., vol. 5, Lief. 2, p. 130, pl. 15, figs. 1, 2; pl. 38, figs. 2, 3, 1906.

Localities.—Station 5116; Verde Island passage; Sombrero Island bearing N. 69° E., 2.5 miles distant (lat. 13°41′00″ N., long. 120° 47′05″ E.); 366 meters; bottom temperature 10.11° C.; January 20, 1908. Four specimens.

Station 5122; east coast of Mindoro; Malabrigo Light bearing N. 46° W., 20.6 miles distant (lat. 13°21′30″ N., long. 120°30′33″ E.); 402 meters; green mud; February 2, 1908. Several young specimens.

Station 5123; east coast of Mindoro; Malabrigo Light bearing N. 44° W., 32.5 miles distant (lat. 13°12′45″ N., long. 121°38′45″ E.); 507 meters; green mud; February 2, 1908. Four specimens.

Station 5124; east coast of Mindoro; Point Origon (N.) bearing S. 56° E., 20.75 miles distant (lat. 12°52′00″ N., long. 121°48′30″ E.); 514 meters; soft green mud; February 2, 1908. Eight specimens.

Station 5183; between Panay and Negros; Lusaran Light bearing S. 29° E., 4 miles distant (lat. 10°32′48″ N., long. 122°26′00″ E.); 175 meters; bottom temperature 17.44° C.; soft green mud; March 30, 1908. Several specimens.

Station 5219; between Marinduque and Luzon; Mompog Island (NE.) bearing N. 35°30′ W., 12.25 miles distant (lat. 13°21′00″ N., long. 122°18′45″ E.); 969 meters; bottom temperature 10.44° C.; green mud; April 23, 1908. Three specimens.

Station 5221; between Marinduque and Luzon; San Andreas Island (W.) bearing S. 27° E., 5.5 miles distant (lat. 13°38′15″ N., long. 121°48′15″ E.); 353 meters; bottom temperature 11.33° C.; green mud; April 24, 1908. Three specimens.

Station 5259; off northwestern Panay; Caluya Island (S.) bearing S. 73° W., 12 miles distant (lat. 11°57′30″ N., long. 121°42′15″

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E.); 570 meters; bottom temperature 9.61° C.; gray mud and globigerina ooze; June 3, 1908. Six specimens.

Station 5274; China Sea, in the vicinity of southern Luzon; Malavatuan Island (N.) bearing S. 73°30′ E., 17.5 miles distant (lat. 13°57′30″ N., long. 120°03′25″ E.); 960 meters; bottom temperature 5.17° C.; gray mud and sand; July 16, 1908. One specimen.

Station 5282; China Sea, in the vicinity of southern Luzon; Malavatuan Island (N.) bearing S. 84° W., 6.2 miles distant (lat. 13°53′00″ N., long. 120°26′45″ E.); 353 meters; bottom temperature 8.56° C.; dark gray sand; July 18, 1908. One specimen.

Station 5348; Palawan passage; Point Tabonan bearing S. 89° E., 33.5 miles distant (lat. 10°57′45″ N., long. 118°38′15″ E.); 685 meters; bottom temperature 13.56° C.; coral sand; December 27, 1908. Three specimens.

Station 5349; Palawan passage; Point Tobonan bearing N. 85° E., 45.2 miles distant (lat. 10°54′00″N., long. 118°26′20″E.); 1,334 meters; bottom temperature 4.78° C.; coral sand; December 27, 1908. Three specimens.

Station 5373; in the vicinity of Marinduque Island; Tayabas Light (outer) bearing N. 20° E., 15 miles distant (lat. 13°40′00″ N., long. 121°31′10″ E.); 618 meters; bottom temperature 11.00° C.; soft mud; March 2, 1909. One specimen.

Station 5378; in the vicinity of Marinduque Island; Mompog Island (E.) bearing N. 38° W., 17 miles distant (lat. 13°17′45″ N., long. 122°22′00″ E.); 722 meters; bottom temperature 10.22° C.; soft green mud; March 4, 1909. One specimen.

Station 5421; between Panay and Guimaras; Lusaran Point Light bearing S. 27° E., 5 miles distant (lat. 10°33′30″ N., long. 122°26′00″ E.); 250 meters; bottom temperature 14.67° C.; green mud; March 30, 1909. Four specimens.

Station 5423; Jolo (Sulu) Sea; Cagayan Island, Cagayanes Islands (S.) bearing S. 11° E., 4.8 miles distant (lat. 9°38′30″ N., long. 121°11′00″ E.); 929 meters; bottom temperature 9.89° C.; gray mud and coral sand; March 31, 1909. Four specimens.

Station 5441; west coast of Luzon; San Fernando Point Light bearing S. 87° E., 18.7 miles distant (lat. 16°38′00″ N., long. 119°57′18″ E.); 340 meters; bottom temperature 11.78° C.; May 10, 1909. One specimen.

Station 5444; east coast of Luzon; Atalaya Point, Batag Island, bearing S. 65° E., 5.1 miles distant (lat. 12°43′51″ N., long. 124°58′50″ E.); 563 meters; bottom temperature 7.39° C.; green mud; June 3, 1909. Two specimens.

Station 5447; east coast of Luzon; San Miguel Point bearing S. 7° W., 3.5 miles distant (lat. 13°28′00″ N., long. 123°40′18″ E.); 567

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meters; bottom temperature 7.39° C.; green mud; June 4, 1909. One young specimen the identification of which is not beyond doubt.

Station 5467; east coast of Luzon; Atulayan Island (S.) bearing S. 79° W., 2.5 miles distant (lat. 13°35′27″ N., long. 123°37′18″ E.); 877 meters; gray mud; June 18, 1909. Three specimens.

Station 5494; between Leyte and Mindanao; Diuata Point (N.) bearing N. 74° W., 4.2 miles distant (lat. 9°06′30″ N., long. 125° 18′40″ E.); 1,239 meters; bottom temperature 11.83° C.; green mud and sand; August 2, 1909. Six specimens.

Station 5505; in the vicinity of northern Mindanao; Macabalan Point Light bearing S. 31° E., 7.7 miles distant (lat. 8°37′15″ N., long. 124°36′00″ E.); 402 meters; August 5, 1909. Two specimens.

Station 5512; in the vicinity of northern Mindanao; Camp Overton Light bearing S. 76° E., 14 miles distant (lat. 8°16′02″ N., long. 123°58′26″ E.); 813 meters; bottom temperature 11.56° C.; gray mud and fine sand; August 7, 1909. One specimen.

Station 5513; in the vicinity of northern Mindanao; Camp Overton Light bearing S. 67° E., 10.3 miles distant (lat. 8°16′45″ N.; long. 124°02′48″ E.); 923 meters; bottom temperature 11.56° C.; gray mud and fine sand; August 7, 1909. One specimen.

Station 5515; in the vicinity of northern Mindanao; Camp Overton Light bearing S. 26° E., 24.6 miles distant (lat. 8°34′48″ N., long. 124°01′24″ E.); August 8, 1909. Ten specimens.

Station 5536; between Negros and Siquijor; Apo Island (C.) bearing S. 26° W., 11.8 miles distant (lat. 9°15′45″ N., long. 123° 22′00″ E.); 510 meters; bottom temperature 11.95° C.; green mud; August 19, 1909. Two specimens.

Station 5565; between Jolo and Tawi Tawi; Dammi Island (N.) bearing S. 69° W., 6 miles distant (lat. 5°51′42″ N., long. 120° 30′30″ E.); 444 meters; bottom temperature 11.28° C.; sand and pteropod shells; September 21, 1909. Five specimens.

Station 5575; north of Tawi Tawi; Mt. Dromedario, Tawi Tawi, bearing S. 16° W., 19.2 miles distant (lat. 5°28′30″ N., long. 120° 02′27″ E.); 576 meters; bottom temperature 11.28° C.; coral sand; September 23, 1909. One specimen.

Station 5582; in the vicinity of Darvel Bay, Borneo; Si Amil Island (N.) bearing S. 82° W., 6.2 miles distant (lat. 4°19′54″ N., long. 118°58′38″ E.); 1,627 meters; bottom temperature 3.50° C.; gray mud and fine sand; September 26, 1909. One specimen.

Station 5586; Sibuko Bay, Borneo; Sipadan Island (M.) bearing W. 9.4 miles distant (lat. 4°06′50″ N., long. 118°47′20″ E.); 634 meters; bottom temperature 6.67° C.; gray mud; September 28, 1909. One specimen.

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Station 5587; in the vicinity of Sibuko Bay, Borneo; Sipadan Island (W.) bearing S. 12° E., 3.8 miles distant (lat. 4°10′35″ N., long. 118°37′12″ E.); 759 meters; bottom temperature 5.72° C.; coral sand; September 28, 1909. Five specimens.

Station 5589; in the vicinity of Sibuko Bay, Borneo; Mabul Island (NW.) bearing N. 3° W., 2.8 miles distant (lat. 4°12′10″ N., long. 118°38′08″ E.); 475 meters; bottom temperature 7.61° C.; fine gray sand and gray mud; September 29, 1909. Three specimens.

Station 5592; in the vicinity of Sibuko Bay, Borneo; Silungan Island (M.) bearing N. 1° W., 6.4 miles distant (lat. 4°12′44″ N., long. 118°27′44″ E.); 557 meters; bottom temperature 6.28 C.; green mud; September 29, 1909. One specimen.

Station 5630; south of Patiente Strait; Doworra Island (N.) bearing N. 3° W., 4.5 miles distant (lat. 0°56′30″ S., long. 128°05′00″ E.); 1,040 meters; coral sand and mud; December 2, 1909. One specimen.

Station 5638; in the vicinity of Bouro Island; Tifu Bay entrance (W.) bearing N. 17° E., 3.2 miles distant (lat. 3°47′15″ S., long. 126°23′40″ E.); 945 meters; fine gray sand; December 10, 1909. One specimen.

Remarks.—The specimens are on the whole in poor condition. Most of them are small or of medium size. Those from station 5122 are particularly interesting, being the youngest known of this species, ranging from about 15 to 30 mm. in diameter. They show that the genital pores begin to appear at a size of approximately 25 mm. diameter. In the smallest specimen the genital and ocular plates are not yet completely separated.

In a specimen from station 5421 I find the spines of the aboral side more or less thorny, thus recalling to some degree *Phormosoma verticillatum;* but the thorns are not arranged in whorls as is so characteristic of *P. verticillatum.*

Most of the specimens are of the form designated by Döderlein as *Phormosoma indicum*, characterized by the aboral side being naked to a wide extent. There are, however, all transitions between such specimens, with an extensive naked part of the aboral side, to such as have all the plates of the aboral side provided with spines, so that I do not see any possibility of maintaining *P. indicum* as a distinct species, or even as a distinct variety.

PHORMOSOMA VERTICILLATUM Mortensen

Phormosoma verticillatum Mortensen, Ann. Mag. Nat. Hist., ser. 7, vol. 14, p. 90, pl. 4, figs. 1, 2; pl. 5, figs. 15–17, 1904; Monograph of the Echinoidea, pt. 2, p. 142, pl. 3, figs. 3, 4; pl. 4, fig. 4; pl. 74, figs. 7–10, 1935.

Phormosoma adenicum Döderlein, Wiss. Ergebn. Tiefsee-Exped., vol. 5, Lief. 2, p. 134, pl. 15, fig. 3; pl. 38, fig. 4, 1906.

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Locality.—Station 5654; Gulf of Boni, Celebes; Cape Tabako bearing N. 17° E., 21.5 miles distant (lat. 3°42′00″ S., long. 120°15′50″ E.); 1,472 meters; December 18, 1909. Several specimens, most of them in poor condition.

Remarks.—It is beyond doubt that Döderlein's *Phormosoma adenicum* is identical with *P. verticillatum.* This seemed almost certain from the description and figures given by Döderlein, the lacking of the characteristic verticillate aboral spines being the only tangible difference. A reexamination of the type specimen of *P. adenicum,* kindly lent me by the Berlin Museum, showed, however, that the verticillate spines are actually present, and the identity of *adenicum* with *verticillatum* is thus definitely proved.

Parasite.—In the intestinal canal of this species was found a curious parasitic copepod, which has been described under the name *Dichelina phormosomae* by K. Stephensen.[3] The same species of parasite was found also in *Phormosoma bursarium.*

Genus HEMIPHORMOSOMA Mortensen

Hemiphormosoma MORTENSEN, Vid. Medd. Dansk Naturh. Foren., vol. 98, p. 162, 1934; Monograph of the Echinoidea, vol. 2, p. 149, 1935.

Characters.—This genus differs from *Phormosoma* in the very feeble development of the large areoles, which are confined to the two distalmost plates on the oral side, and the distalmost one on the aboral side. Also the fact that the demiplates of the ambulacra on the oral side are usually excluded from the edge of the ambulacral area is a noteworthy difference from *Phormosoma.* Whether the remarkably short valves of the tridentate pedicellariae represent a generic or merely a specific character cannot be decided so long as only a single species, the genotype, is known.

HEMIPHORMOSOMA PAUCISPINUM Mortensen

FIGURE 1

Hemiphormosoma paucispinum MORTENSEN, Vid. Medd. Dansk Naturh. Foren., vol. 98, p. 162, 1934; Monograph of the Echinoidea, vol. 2, p. 149, pl. 4, figs. 1–3; pl. 74, figs. 10–13, 1935.

Locality.—Station 5359; Jolo (Sulu) Sea; (lat. 8°12′45″ N., long. 120°37′15″ E.); 4,159 meters; January 9, 1909. Six specimens.

Remarks.—A full description of this species has been given in my Monograph of the Echinoidea. It may only be pointed out that the gill slits are exceptionally well developed for an echinothurid (fig. 1). The very delicate structure of the test appears to stand in relation to the very great depth at which this echinothurid lives. In this feature it recalls another deep-sea echinothurid, *Kamptosoma asterias* (A.

[3] Vid. Medd. Dansk Naturh. Foren., vol. 93, p. 207, 1933.

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Agassiz), which occurs at about the same depths (3,890 to 4,950 meters).

Genus PARAPHORMOSOMA Mortensen

PARAPHORMOSOMA ALTERNANS (de Meijere)

Phormosoma alternans DE MEIJERE, *Siboga* Echinoidea, p. 31, pl. 3, figs. 21–22; pl. 12, figs. 143–148, 1904.

Paraphormosoma alternans MORTENSEN, Monograph of the Echinoidea, vol. 2, p. 152, pl. 4, figs. 5–8; pl. 76, figs. 14–16, 1935.

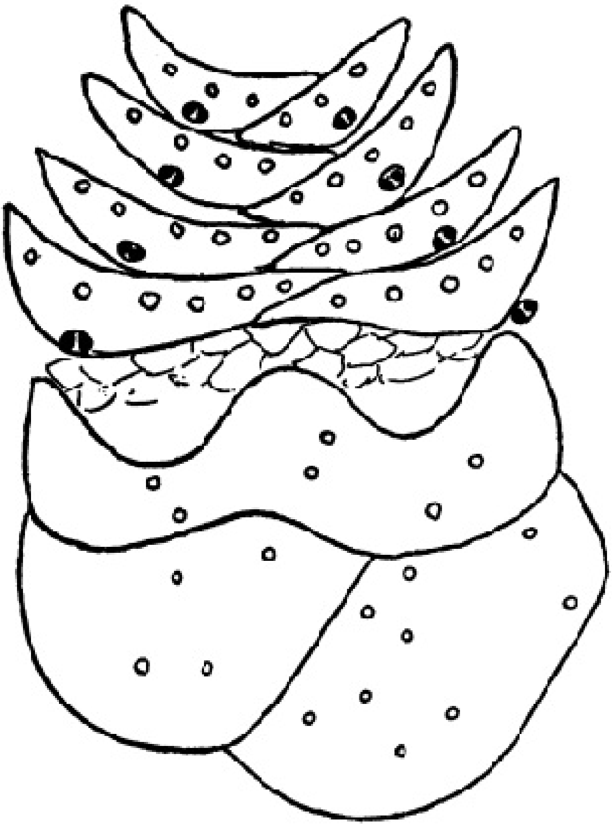


FIGURE 1.—Part of peristome and adjoining interambulacrum of *Hemiphormosoma paucispinum* Mortensen, showing the gill slits, i. e., the two notches in the adoral edge of the primordial interambulacral plate. The two series of peristomial ambulacral plates belong to two neighboring ambulacra. × 6.

Locality.—Station 5585.

Remarks.—It was a matter of great satisfaction to find in the *Albatross* material a specimen of this species, hitherto known only from the single specimen described in the *Siboga* Echinoidea. It is a good deal larger (74 mm. in diameter) than the type specimen (52 mm. in diameter). Still, it is not adult, as evidenced by the fact that genital pores have not yet been formed. This indicates that the species must grow to a much larger size and is therefore among the larger forms in the Echinothuridae.

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The specimen is not in a very good state of preservation; particularly is it regrettable that all the primary spines of the oral side are broken, not one of them showing the skin bag enclosing the end of the spines. Still, there cannot be the slightest doubt of the correctness of the identification, the more so as I have had the type specimen for direct comparison.

The specimen was completely collapsed and partly torn. But by stuffing it, as explained above, I made it assume its natural shape, showing the shape of the test to be low-hemispherical.

Already de Meijere was in doubt whether this species could properly be referred to the genus *Phormosoma*. The careful study of the two known specimens that I have been able to undertake shows conclusively that it represents a distinct generic type. The main characters distinguishing it from *Phormosoma* are these: The areoles of the oral side are not sunken; there is no marginal fringe, the tubercles of the oral side continuing without interruption on to the aboral side; the edge of the test is not sharp, as in *Phormosoma*. The outer demiplate of the ambulacra on the aboral side remains broadly in contact with the interambulacral edge, this last character being from a morphological point of view the most important. In the larger *Albatross* specimen the outer demiplates even increase so much in size as to exclude the primary plates from the edge of the area; as a matter of fact, we have here a many-plated condition of the ambulacra directly comparable to that found in various Paleozoic echinoids.[4]

Subfamily ASTHENOSOMINAE

Genus TROMIKOSOMA Mortensen

TROMIKOSOMA TENUE (A. Agassiz)

Phormosoma tenue A. AGASSIZ, *Challenger* Reports, Zoology, vol. 3, pt. 9, Echinoidea, p. 91, pl. 13; pl. 14; pl. 17a, fig. 8; pl. 18a, figs. 1–13; pl. 18b; pl. 1 18c, figs. 5, 6, 8, 9; pl. 19a, fig. 2; pl. 42, fig. 7; pl. 44, figs. 7–9, 1881.

Echinosoma tenue MORTENSEN, *Ingolf* Echinoidea, pt. 1, pp. 56, 63, 177, pl. 12, figs. 35, 40, 1903; pt. 2, pp. 6, 21, 1907.—A. AGASSIZ and H. L. CLARK, Hawaiian and other Pacific Echini, Echinothuridae, p. 165, pl. 67, figs. 12–21, 1909.

Tromikosoma tenue MORTENSEN, Monograph of the Echinoidea, vol. 2, p. 171, pl. 6, fig. 1; pl. 7, figs. 1–5; pl. 75, figs. 8–17, 1935.

Locality.—Station 5636; Pitt passage; Gomomo Island (E.) bearing N. 46° W., 6 miles distant (lat. 1°55′00″ S., long. 127°42′30″ E.); 2,307 meters; gray mud and fine sand; December 3, 1909. Three specimens.

Remarks.—That these specimens are identical with the typical *T. tenue* from off Japan is beyond doubt, and the occurrence in the Malay

[4] *Cf.* Mortensen, Monograph of the Echinoidea, vol. 2, p. 85, fig. 56, 1935.

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region of this species, hitherto known only from the North Pacific (Japan to the Aleutian Islands) has thus been established. This distribution is in full accord with that of so many other deep-sea echinoderms that it might well have been expected in advance.

The name *Echinosoma* hitherto used for this and other species is preoccupied no less than three times—for a holothurian, a beetle, and an earwig. The name *Tromikosoma*, proposed by me in 1903 [5] for the species *koehleri*, which is undoubtedly congeneric with the present species, as is justly maintained by Agassiz and Clark, thus takes the place of *Echinosoma* as the name of the genus to which this species should be referred. Regarding the characters of this genus, in a restricted sense (Agassiz and Clark took it in a wide sense comprising also the genus *Hygrosoma*, which is entirely untenable), I must refer to my Monograph of the Echinoidea, vol. 2, p. 164.

Genus SPEROSOMA Koehler

SPEROSOMA CRASSISPINUM Mortensen

FIGURE 2

Sperosoma crassispinum MORTENSEN, Vid. Medd. Dansk Naturh. Foren., vol. 98, p. 163, 1934; Monograph of the Echinoidea, vol. 2, p. 195, pl. 9, fig. 2; pl. 10, fig. 2; pl. 77, figs. 13–17, 1935.

Locality.—Station 5616; Molucca passage; Tifore Island (C.) bearing N. 40° W. 35 miles distant (lat. 0°32′30″ N., long. 126°31′30″ E.); 1,866 meters; gravel; November 22, 1909. One specimen.

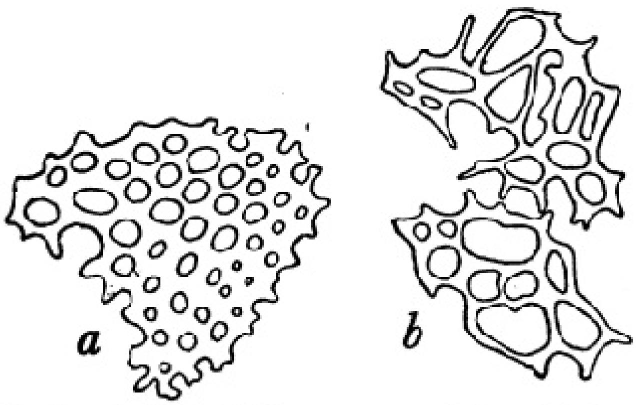


FIGURE 2.—Spicules from tubefeet of *Sperosoma crassispinum* Mortensen: *a*, From oral tubefoot; *b*, from aboral tubefoot. × 200.

Remarks.—A full description and figures of this specimen are given in my Monograph, to which the reader is referred. It has a size of about 145 mm. in diameter.

Besides by the rather coarse spines—a feature to which the specific name refers—this species differs markedly from the other known

[5] Mortensen, *Ingolf* Echinoidea, pt. 1, p. 62, 1903.

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species of this genus in having the primary ambulacral plates of the aboral side undivided. The pedicellariae recall those of *Sperosoma grimaldii* Koehler, to which the present species has otherwise apparently no nearer relation.

I give here figures of the rather large spicules of the tubefeet (fig. 2), these having been inadvertently omitted from the Monograph.

SPEROSOMA TRISTICHUM Mortensen

Sperosoma tristichum MORTENSEN, Vid. Medd. Dansk Naturh. Foren., vol. 98, p. 163, 1934; Monograph of the Echinoidea, vol. 2, p. 197, pl. 12, figs. 2, 3; pl. 77, figs. 18–22, 1935.

Locality.—Station 5585; in the vicinity of Sibuko Bay, Borneo; Sipadan Island (M.) bearing S. 89° W., 12 miles distant (lat. 4°07′00″ N., long. 118°49′54″ E.); 870 meters; bottom temperature 5.06° C.; gray mud; September 28, 1909. One specimen.

Remarks.—Also of this species a full description, with figures, is given in my Monograph, to which the reader is referred. The specimen has a diameter of 95 mm.

This species differs markedly from the other known species of *Sperosoma* in the arrangement of the pores on the aboral side in arcs of three, instead of the usual arrangement in more or less regular quincunx. The pedicellariae are not very characteristic.

SPEROSOMA species (juv.)

FIGURE 3

Localities.—Station 5332; in Mindoro Strait; Apo Light bearing S. 66° W., 18.2 miles distant (lat. 12°47′15″ N., long. 120°41′00″ E.); 1,362 meters; bottom temperature 3.44° C.; green mud; December 12, 1909. One specimen.

Station 5608; Gulf of Tomini, Celebes; Binang Unang peak bearing S. 87° E., 19 miles distant (lat. 0°08′00″ S., long. 121°19′00″ E.); 1,991 meters; bottom temperature 2.39° C.; gray mud; November 18, 1909. One specimen.

Remarks.—The specimen from station 5608 is 25 mm. in diameter, and that from station 5332 is 23 mm. in diameter. The number of plates in the specimen 25 mm. in diameter (station 5608) is 5–6 ambulacral plates on the oral, 11–12 on the aboral side, and the same numbers respectively in the interambulacra. In the specimen 23 mm. in diameter (station 5332) there are 5–6 ambulacral plates on the oral, 7–8 on the aboral side, and the same numbers respectively in the interambulacra. Both specimens have only three plates in a series on the peristome.

The tridentate pedicellariae are characteristic in having a distinct arc under the articular surface (fig. 3, *a*), a character otherwise known only in *Sperosoma durum* Döderlein. In the smaller specimen there

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are numerous ophicephalous pedicellariae (fig. 3, *d*) also resembling those of *S. durum*. In the larger specimen only a single ophicephalous pedicellaria was found, which looks rather different (fig. 3, *b*)—not like those of *S. durum*.

The smaller specimen is a beautiful purple, the larger a light grayish.

These two small specimens cannot with certainty be referred to any of the species known from the Malay Archipelago. It can only be seen with certainty that they belong to the genus *Sperosoma*, since some of the oral ambulacral plates are divided into two in the way typical of this genus. It is not very likely that both belong to one

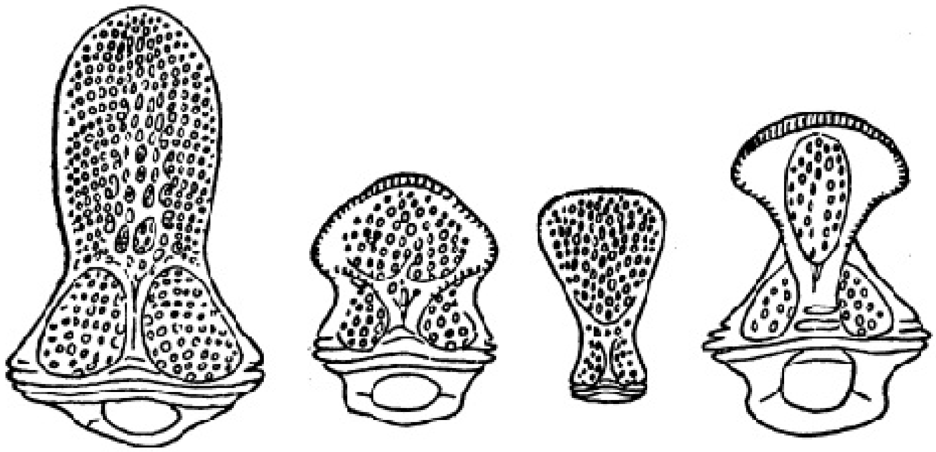


FIGURE 3.—Valves of pedicellariae of *Sperosoma* sp., young: *a–c*, Specimen from station 5608; *d*, specimen from station 5332. *a*, Valve of tridentate pedicellaria; possibly the edge of the blade not yet fully developed (without serrations); *b* and *d*, Valves of ophicephalous pedicellariae; *c*, valve of triphyllous pedicellaria. All × 80.

and the same species, in spite of the fact that both have the peculiar arc under the valves of the tridentate pedicellariae; the different shape of the ophicephalous pedicellariae would seem to preclude the idea of their belonging to the same species. That one of them may be identical with *S. durum* is quite possible; but the fact that the small specimen, the ophicephalous pedicellariae of which resemble those of *S. durum*, has the fewer number of aboral ambulacral plates, whereas *S. durum* has, when adult, about three times as many aboral as oral ambulacral plates, is not in favor of such identity. That *S. durum* is known hitherto only from the Indian Ocean off the African coast—only one specimen is known—would not be any serious objection to their identity.

On the whole, a much richer material, with series of intermediate sizes, will be necessary for identifying with certainty these young specimens, or for deciding whether they perhaps represent hitherto unknown species.

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Genus HYGROSOMA Mortensen

HYGROSOMA HOPLACANTHA (Wyville Thomson)

Phormosoma hoplacantha A. AGASSIZ, *Challenger* Reports, Zoology, vol. 3, pt. 9, Echinoidea, p. 101, pl. 11; pl. 12; pl. 12a, figs. 10–13, 1881.

Hygrosoma hoplacantha MORTENSEN, *Ingolf* Echinoidea, pt. 1, p. 59, 1903; Monograph of the Echinoidea, vol. 2, p. 208, pl. 18, fig. 1; pl. 19, fig. 1; pl. 20, figs. 1, 2; pl. 78, fig. 2, 1935.

Echinosoma hoplacantha A. AGASSIZ and H. L. CLARK, Hawaiian and other Pacific Echini, Echinothuridae, p. 161, 1909.

Localities.—Station 5116; Verde Island passage; Sombrero Island bearing N. 69° E., 2.5 miles distant (lat. 13°41′00″ N., long. 120° 47′05″ E.); 366 meters; bottom temperature 10.11° C.; January 20, 1908. One specimen.

Station 5123; east coast Mindoro; Malabrigo Light bearing N. 44° W., 32.5 miles distant (lat. 13°12′45″ N., long. 121°38′45″ E.); 517 meters; green mud; February 2, 1908. Two specimens.

Station 5281; China Sea, in the vicinity of southern Luzon; Malavatuan Island (N.) bearing S. 84° W., 4.3 miles distant (lat. 13°52′45″ N., long. 120°25′00″ E.); 367 meters; bottom temperature 10.22° C.; dark gray sand; July 18, 1908. Three specimens.

Station 5282; China Sea in the vicinity of southern Luzon; Malavatuan Island (N.) bearing S. 84° W., 6.2 miles distant (lat. 13°53′00″ N., long. 120°26′45″ E.); 453 meters; bottom temperature 8.56° C.; dark gray sand; July 18, 1908. Three specimens.

Station 5283; China Sea, in the vicinity of southern Luzon; Malavatuan Island (N.) bearing N. 64° W., 8.75 miles distant (lat. 13°48′30″ N., long. 120°28′40″ E.); 512 meters; bottom temperature 8.22° C.; dark gray sand; July 18, 1908. Four specimens.

Station 5424; Jolo Sea; Cagayan Island (S.) bearing S. 11° W., 3.4 miles distant (lat. 9°37′05″ N., long. 121°12′37″ E.); 622 meters; bottom temperature 10.22° C.; coral sand; March 31, 1909. One specimen.

Station 5428; in the vicinity of eastern Palawan; Thirtieth of June Island bearing N. 62° W., 19.5 miles distant (lat. 9°13′00″ N., long. 118°51′15″ E.); 2,020 meters; gray mud; April 3, 1909. One specimen.

Station 5445; east coast of Luzon; Atalaya Point, Batag Island, bearing S. 64° E., 3.6 miles distant (lat. 12°43′05″ N., long. 125° 01′00″ E.); 700 meters; bottom temperature 6.83° C.; green mud and sand; June 3, 1909. Ten specimens.

Station 5450; eastern coast of Luzon; East Point, Batan Island, bearing S. 36° E., 9.2 miles distant (lat. 13°23′15″ N., long. 124° 00′30″ E.); 734 meters; bottom temperature 5.72° C.; green mud and coral; June 4, 1909. One specimen.

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Station 5487; between Leyte and Mindanao; San Ricardo Point, Panaon Island, bearing S. 50° E., 11.2 miles distant (lat. 10°02′45″ N., long. 125°05′33″ E.); 1,338 meters; bottom temperature 11.28° C.; green mud; July 31, 1909. One specimen.

Station 5488; between Leyte and Mindanao; San Ricardo Point, Panaon Island, bearing S. 59° E., 9 miles distant (lat. 10°00′00″ N., long. 125°06′45″ E.); 1,411 meters; bottom temperature 11.28° C.; green mud; July 31, 1909. One young specimen, and fragments of a larger one.

Station 5492; between Leyte and Mindanao; Diuata Point (W.) bearing S. 45° W., 15.2 miles distant (9°12′45″ N., long. 125°20′ 00″ E.); 1,344 meters; bottom temperature 11.28° C.; gray mud; August 1, 1909. Three specimens.

Station 5494; between Leyte and Mindanao; Diuata Point (N.) bearing N. 74° W., 4.2 miles distant (lat. 9°06′30″ N., long. 125° 18′40″ E.); 1,239 meters; bottom temperature 11.83° C.; green mud and sand; August 2, 1909. Twelve specimens.

Station 5513; in the vicinity of northern Mindanao; Camp Overton Light bearing S. 67° E., 10.3 miles distant (lat. 8°16′45″ N., long. 124°02′48″ E.); 923 meters; bottom temperature 11.56° C.; gray mud and fine sand; August 7, 1909. Two specimens.

Station 5566; between Jolo and Tawi Tawi; Dammi Island (N.) bearing S. 67° W., 6.8 miles distant (lat. 5°52′12″ N., long. 120° 31′00″ E.); 446 meters; bottom temperature 11.28° C.; fine sand and shells; September 21, 1909. One specimen.

Station 5575; north of Tawi Tawi; Mt. Dromedario, Tawi Tawi, bearing S. 16° W., 19.2 miles distant (lat. 5°28′30″ N., long. 120° 02′27″ E.); 576 meters; bottom temperature 11.28° C.; coral and sand; September 23, 1909. Six specimens.

Station 5585; in the vicinity of Sibuko Bay, Borneo; Sipadan Island (M.) bearing S. 89° W., 12 miles distant (lat. 4°07′00″ N., long. 118°49′54″ E.); 870 meters; bottom temperature 5.06° C.; gray mud; September 28, 1909. One specimen.

Station 5586; in the vicinity of Sibuko Bay, Borneo; Sipadan Island (M.) bearing W. 9.4 miles distant (lat. 4°06′50″ N., long. 118°47′20″ E.); 634 meters; bottom temperature 6.67° C.; gray mud; September 28, 1909. Three specimens.

Station 5587; in the vicinity of Sibuko Bay, Borneo; Sipadan Island (W.) bearing S. 12° E., 3.8 miles distant (lat. 4°10′35″ N., long. 118°37′12″ E.); 759 meters; bottom temperature 5.72° C.; green mud, sand, and coral; September 28, 1909. One specimen.

Station 5601a; Gulf of Tomini, Celebes; Limbe Island (NE.) bearing N. 20.7 miles distant (lat. 1°13′10″ N., long. 125°17′05″ E.); 1,398 meters; sand, globigerinae, and pteropods; November 13, 1909. Two specimens.

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Station 5605; Gulf of Tomini, Celebes; Dodepo Island (W.) bearing N. 14° W., 5.9 miles distant (lat. 0°21′33″ N., long. 121°34′10″ E.); 1,183 meters; November 16, 1909. Three specimens.

Station 5606; Gulf of Tomini, Celebes; Dodepo Island (W.) bearing N. 3° W., 10.8 miles distant (lat. 0°16′28″ N., long. 121°33′30″); 1,525 meters; green mud; November 17, 1909. One specimen.

Station 5608; Gulf of Tomini, Celebes; Binang Unang Island peak bearing S. 87° E., 19 miles distant (lat. 0°08′00″ S., long. 121°19′00″ E.); 1,991 meters; bottom temperature 2.39° C.; gray mud; November 18, 1909. One specimen.

Station 5609; Gulf of Tomini, Celebes; Binang Unang Island (N.) bearing N. 80° E., 21 miles distant (lat. 0°11′00″ S., long. 121°16′00″ E.); 1,996 meters; bottom temperature 2.39° C.; green mud; November 18, 1909. One young specimen, the identification of which is not beyond doubt.

Station 5638; in the vicinity of Bouro Island; Tifu Bay entrance (W.) bearing N. 17° E., 3.2 miles distant (lat. 3°47′15″ S., long. 126°23′40″ E.); 945 meters; fine gray sand; December 10, 1909. One specimen.

Station 5650; Gulf of Boni, Celebes; Lamulu Point bearing N. 5° W., 12.5 miles distant (lat. 4°53′45″ S., long. 121°29′00″ E.); 987 meters; green mud; December 17, 1909. Two specimens.

Station 5656; Gulf of Boni, Celebes; Olang Point bearing N. 67° W., 14.5 miles distant (lat. 3°17′40″ S., long. 120°36′45″ E.); 871 meters; gray mud; December 19, 1909. Two specimens.

Remarks.—Most of the specimens are in poor, or very poor, condition. Only one of the largest specimens, 200 mm. in diameter — none exceed that size — from station 5568 and a small specimen from station 5683 have each a couple of oral spines with the hoof preserved. In the latter a small barnacle of the genus *Scalpellum* is attached to one of them.

Only a few of the specimens have kept their original dark purple, or black, color. Most of them are yellowish, though I have little doubt that these were originally dark colored also but have lost their color gradually.

In a young specimen 21 mm. in diameter from station 5492 I have found a couple of ophicephalous pedicellariae. Unfortunately no tridentate pedicellariae are found in this specimen, but a comparison with other young specimens, slightly larger, seems to leave no room for doubt that it is really a young *Hygrosoma hoplacantha*, so that also this species may have ophicephalous pedicellariae when young, and that will then probably hold good for all the species of *Hygrosoma*, though as yet not known in *H. luculentum*. It is noteworthy

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that these ophicephalous pedicellariae are quite different from those of *Tromikosoma*, having no neck, and with the stalk simple, not tube-shaped as in the latter genus.

The larger specimens are conspicuously pentagonal.

The contents of the intestinal canal of the larger specimens was found to be mainly bits of land plants.

HYGROSOMA LUCULENTUM (A. Agassiz)

Phormosoma luculentum A. AGASSIZ, *Challenger* Reports, Zoology, vol. 3, pt. 9, Echinoidea, p. 97, pl. 9; pl. 10; pl. 10a, figs. 3–7; pl. 39, fig. 8; pl. 40, figs. 31–36; pl. 44, figs. 25–27, 1881.

Hygrosoma luculentum MORTENSEN, *Ingolf* Echinoidea, pt. 1, pp. 59, 64, pl. 12, fig. 20; pl. 13, figs. 14, 16, 1903. — DÖDERLEIN, Wiss. Ergebn. Tiefsee-Exped., vol. 5, Lief. 2, p. 143, pl. 17, fig. 2; pl. 39, fig. 1, 1906. —KOEHLER, *Investigator* Echinoidea, pt. 3, p. 36, pl. 24, fig. 1, 1927.—MORTENSEN, Monograph of the Echinoidea, vol. 2, p. 215, pl. 21; pl. 22; pl. 78, figs. 22, 23, 1935.

Echinosoma luculentum A. AGASSIZ and H. L. CLARK, Hawaiian and other Pacific Echini, Echinothuridae, p. 163, 1909.

Localities.—Station 5447; east coast of Luzon; San Miguel Point bearing S. 7° W., 3.5 miles distant (lat. 13°28′00″ N., long. 123°46′ 18″ E.); 567 meters; bottom temperature 7.39° C.; green mud; June 4, 1909. One specimen.

Station 5506; off northern Mindanao; Macabalan Point Light, Mindanao, bearing S. 41° E., 12.2 miles distant (lat. 8°40′00″ N., long. 124°31′45″ E.); 479 meters; bottom temperature 11.83° C.; green mud; August 5, 1909. One specimen.

Station 5512; in the vicinity of northern Mindanao; Camp Overton Light bearing S. 76° E., 14 miles distant (lat. 8°16′02″ N., long. 123°58′26″ E.); 813 meters; bottom temperature 11.56° C.; gray mud and fine sand; August 7, 1909. One specimen.

Remarks.—The specimens from stations 5506 and 5512, both of which are small, should perhaps rather be referred to *H. hoplacantha*, neither having the typical large broad-valved pedicellariae so characteristic of *luculentum*. But there is, in the former at least, one pedicellaria intermediate between the coarse and the slender form, and in the latter the spines near the apical system appear to have been skin clad, which is another character of *luculentum*. But on the whole *luculentum* is so closely related to *hoplacantha* that it may be doubted even whether they are really different species, and unless very typically developed and well-preserved specimens are at hand it will probably not be possible really to distinguish between them. When the typical coarse pedicellariae are present, as in the specimen from station 5447, there is, of course, no difficulty in distinguishing them.

Like *H. hoplacantha*, this species was found to feed mainly on land plants washed out to sea and sunk to the bottom.

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Genus ARAEOSOMA Mortensen

ARAEOSOMA CORIACEUM (A. Agassiz)

PLATE 1, FIGURE 1

Asthenosoma coriaceum A. AGASSIZ, *Challenger* Reports, Zoology, vol. 3, pt. 9, Echinoidea, p. 88, pl. 17a, figs. 5–7, 1881.

Araeosoma coriaceum MORTENSEN, *Ingolf* Echinoidea, pt. 1, p. 53, pl. 11, fig. 15; pl. 12, fig. 27; pl. 14, fig. 5, 1903; Monograph of the Echinoidea, vol. 2, p. 241, pl. 32; pl. 33; pl. 34; pl. 79, figs. 10–15, 1935.

Locality.—Station 5446; eastern coast of Luzon; Atalaya Point, Batag Island, bearing S. 64° E., 5.3 miles distant (lat. 12°43′51″ N., long. 124°59′18″ E.); 540 meters; green mud; June 3, 1909. One specimen.

Remarks.—That this specimen should be referred to *Araeosoma coriaceum* seems rather certain. It is this specimen that is figured in my Monograph on plates 33 and 34. Some minor differences in regard to the pedicellariae are probably only apparent. I do not find in this specimen any pedicellariae exactly like the form figured in my *Ingolf* report (pl. 14, fig. 5), but the smaller tridentate ones are otherwise exactly as in the type of *coriaceum*. Then I find in the present specimen a large form of involute pedicellariae (pl. 1, fig. 1) that has not been observed in the typical *coriaceum*. These two negative characters cannot, of course, prove the *Albatross* specimen to be a different species, there being no other characters to distinguish them. It may be particularly mentioned that the hoof of the oral primary spines is small and broad in the *Albatross* specimen as it is in the type.

The color of the present specimen is a uniform dark gray.

The aboral plates are straight, as in one of the original specimens.

Agassiz in his preliminary report on the *Challenger* Echinoidea gave this species from station 204 off the Philippines (lat. 12°43′ N., long. 122°10′ E.) in 100 fathoms, whereas in the final report he gave it only from off the Fiji Islands. The specimen from station 204 seems to have disappeared. The finding of the species by the *Albatross* in the Philippine Sea makes it probable that the *Challenger* specimen from this region may have been a true *A. coriaceum*.

The intestine of this specimen, which I have stuffed in order to make it assume its real shape, proved to contain mainly bits of land plants, though also a little bottom material.

ARAEOSOMA TESSELLATUM (A. Agassiz)

Asthenosoma tessellatum A. AGASSIZ, *Challenger* Reports, Zoology, vol. 3, pt. 9, Echinoidea, p. 88, pl. 12a, figs. 14, 15; pl. 19a, fig. 1; pl. 19b, 1881.

Araeosoma tessellatum MORTENSEN, *Ingolf* Echinoidea, pt. 1, pp. 54, 64, pl. 13, figs. 5, 6; pl. 14, fig. 15, 1903.—DE MEIJERE, *Siboga* Echinoidea, p. 35; pl. 13,

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figs. 153–157, 1904.—MORTENSEN, Monograph of the Echinoidea, vol. 2, p. 246, pl. 36; pl. 37; pl. 38, figs. 1, 2; pl. 39; pl. 81, figs. 1–22, 1935.

Localities.—Station 5135; in the vicinity of Jolo (Sulu); Jolo Light bearing S. 46° W., 11.9 miles distant (lat. 6°11′50″ N., long. 121°08′20″ E.); 294 meters; bottom temperature 14.17° C.; fine coral sand; February 7, 1908. Two specimens.

Station 5445; eastern coast of Luzon; Atalaya Point, Batag Island, bearing S. 56° E., 5.3 miles distant (lat. 12°44′42″ N., long. 124°59′50″ E.); 700 meters; bottom temperature 6.83° C.; green mud and sand; June 3, 1909. One specimen.

Station 5452; off the east coast of Luzon; Legaspi Light bearing S. 38° W., 3 miles distant (lat. 13°11′54″ N., long. 123°47′10″ E.); 201 meters; June 7, 1909. One specimen.

Station 5565; between Jolo (Sulu) and Tawi Tawi; Dammi Island (N.) bearing S. 69° W., 6 miles distant (lat. 5°51′42″ N., long. 120°30′30″ E.); 444 meters; bottom temperature 11.28° C.; sand and pteropod shells; September 21, 1909. One specimen.

Remarks.—The specimen from station 5445 is a small one, 45 mm. in diameter. Only very few pedicellariae, of the small tridentate and the triphyllous forms, are preserved, and all the primary spines are broken. But it is in general so very like some specimens of corresponding size from off Zamboanga that I dredged in 1914, which are certainly referable to *A. tessellatum*, that I can have no doubt that this specimen also is a young *A. tessellatum*.

ARAEOSOMA TESSELLATUM var. CARINATUM Mortensen

Araeosoma tessellatum, var. *carinatum* MORTENSEN, Vid. Medd. Dansk Naturh. Foren., vol. 98, p. 163, 1934; Monograph of the Echinoidea, vol. 2, p. 250, pl. 40, figs. 1, 2; pl. 81, fig. 23, 1935.

Locality.—Station 5290; China Sea, in the vicinity of southern Luzon; Matocot Point bearing S. 50° E., 3.1 miles distant (lat. 13°40′09″ N., long. 120°59′30″ E.); 391 meters; lava and gravel; July 22, 1908. Two specimens.

Remarks.—It is quite probable that these specimens rather represent a separate species, but from the material available this can scarcely be decided. The peristomial plates and the ambulacral plates of the oral side are more numerous than in the typical *tessellatum*, but there are transitions in this regard. The only reliable difference appears to be the existence of a longitudinal keel in the valves of the small tridentate pedicellariae, such a keel not being found in typical *tessellatum*. But this would seem too unimportant for a species character. Dactylous pedicellariae were not found. It will then be preferable for the present to designate this form only as a variety of *A. tessellatum*.

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ARAEOSOMA PARVIUNGULATUM Mortensen

Araeosoma parviungulatum MORTENSEN, Vid. Medd. Dansk Naturh. Foren., vol. 98, p. 164, 1934; Monograph of the Echinoidea, vol. 2, p. 254, pl. 43; pl. 44; pl. 77, figs. 1–8, 1935.

Locality.—Station 5645; in Buton Strait; North Island (NE.) bearing S. 10° W., 1.6 miles distant (lat. 5°29′06″ S., long. 122°36′06″ E.); 377 meters; December 16, 1909. One specimen.

Remarks.—A full description of this species, with figures, is given in the Monograph. It appears to be most nearly related to *A. coriaceum*, from which, however, it is easily distinguished, particularly by the much broader ambulacra and the much smaller hoofs of the oral primary spines. Also the pedicellariae are somewhat different.

The intestinal canal was found to contain mainly bits of land plants.

ARAEOSOMA OWSTONI var. NUDUM Mortensen

PLATE 1, FIGURES 2, 3

Araeosoma owstoni, var. *nudum* MORTENSEN, Vid. Medd. Dansk Naturh. Foren., vol. 98, p. 164, 1934; Monograph of the Echinoidea, vol. 2, p. 266, pl. 51; pl. 52; pl. 77, figs. 9–12; pl. 80, figs. 1, 2, 1935.

Localities.—Station 5135; in the vicinity of Jolo (Sulu); Jolo Light bearing S. 46° W., 11.9 miles distant (lat. 6°11′50″ N., long. 121°08′20″ E.); 294 meters; bottom temperature 14.11° C.; fine coral sand; February 7, 1908. Two specimens.

Station 5311; China Sea, in the vicinity of Hong Kong (lat. 21°33′00″ N., long. 116°15′00″ E.); 161 meters; coarse sand and shells; November 4, 1908. One specimen.

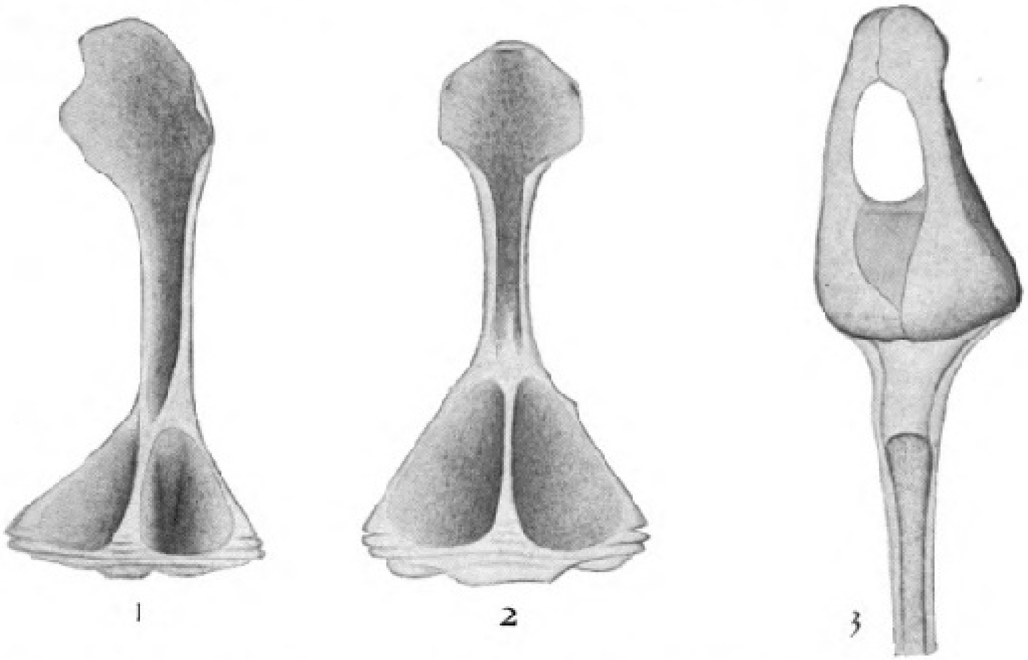
Station 5314; China Sea, in the vicinity of Hong Kong (lat. 21°41′00″ N., long. 116°46′00″ E.); 223 meters; sand and broken shells; November 5, 1908. One specimen.

Station 5446; eastern coast of Luzon; Atalaya Point, Batag Island, bearing S. 64° E., 5.3 miles distant (lat. 12°43′51″ N., long. 124°59′18″ E.); 540 meters; green mud; June 3, 1909. One specimen, the type.

Remarks.—This form differs from typical *A. owstoni* only in having the aboral side much barer, its general appearance being thus conspicuously different from the latter. It seems therefore desirable to distinguish it as a separate variety, in spite of the fact that there appear to be no other tangible differences. The fact that this form occurs also off the coasts of Annam indicates that it is the more southern representative of the typical *A. owstoni* of Japanese seas.

One of the specimens from station 5135 is rather perplexing. It has more numerous tubercles (spines) on the aboral side than usual, and the pedicellariae show some peculiarity in the existence of a large

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1, Valve of large, involute, tridentate pedicellaria of *Araeosoma coriaceum* (A. Agassiz). × 27.
2, Valve of large, involute, tridentate pedicellaria of *Araeosoma owstoni* var. *nudum* Mortensen. Hybrid (?). × 33.
3, Large, involute, tridentate pedicellaria of *Araeosoma owstoni* var. *nudum* Mortensen Hybrid (?). × 17.

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involute form of tridentate pedicellariae (pl. 1, figs. 2, 3) so closely resembling that of *A. coriaceum* that one might be inclined to think this specimen rather to be referable to the latter species. As a matter of fact, I believe this specimen to be a hybrid between *A. coriaceum* and *A. owstoni* var. *nudum*. Since the two forms evidently occur in the same area (the China Sea) there is so far nothing to prevent them from forming hybrids. The unfortunate fact that there are no dactylous pedicellariae to be found in the specimen under consideration prevents reaching a definite conclusion. The dactylous pedicellariae of *A. owstoni* and *A. coriaceum* are very different—3-valved and of a very primitive type in the former, 5-valved and of a highly finished type in the latter.

Genus HAPALOSOMA Mortensen

HAPALOSOMA PELLUCIDUM (A. Agassiz)

Asthenosoma pellucidum A. AGASSIZ, *Challenger* Reports, Zoology, vol. 3, pt. 9, Echinoidea, p. 85, pl. 18, figs. 1–6; pl. 18a, figs. 14–17; pl. 19, figs. 1–6, 1881.

Hapalosoma pellucidum MORTENSEN, *Ingolf* Echinoidea, pt. 1, pp. 55, 64, pl. 11, fig. 19; pl. 12, figs. 8–10, 14; pl. 13, figs. 20, 24, 25, 1903; pt. 2, p. 21, 1907; Monograph of the Echinoidea, vol. 2, p. 271, pl. 53, figs. 1–11; pl. 54, figs. 1, 2; pl. 83, figs. 1, 2, 4–10, 14, 16, 18, 1935.

Araeosoma pellucidum A. AGASSIZ and H. L. CLARK, Hawaiian and other Pacific Echini, Echinothuridae, 1909, p. 181.

Locality.—Station 5135; in the vicinity of Jolo (Sulu); Jolo Light bearing S. 46° W., 11.9 miles distant (lat. 6°11′50″ N., long. 121°08′20″ E.); 294 meters; bottom temperature 14.11° C.; fine coral sand; February 7, 1908. Two specimens.

Remarks.—There can be no doubt that this beautiful and, because of its banded spines and its pedicellariae, easily recognizable species is closely related to the forms in the genus *Araeosoma*, representing a special branch of that genus, as evidenced by its remarkably transformed dactylous pedicellariae. Still, I cannot agree with Agassiz and Clark in simply referring it to *Araeosoma*. Nothing at all is gained by referring it to the large genus *Araeosoma*, within which, together with another species from the Japanese seas hitherto incorrectly identified with *H. pellucidum*, it must form a group of its own. I shall, therefore, have to maintain the genus *Hapalosoma*.

Genus ASTHENOSOMA Grube

ASTHENOSOMA VARIUM Grube

Asthenosoma varium GRUBE, Jahrb. schles. Ges. vaterl. Cultur, vol. 45, p. 42, 1868.—MORTENSEN, Monograph of the Echinoidea, vol. 2, p. 280, pls. 55–58; pl. 61, figs. 1–6; pl. 62, figs. 1, 2; pl. 82, figs. 1–3, 5, 6, 9–14, 1935.

Asthenosoma grubei A. AGASSIZ, *Challenger* Reports, Zoology, vol. 3, pt. 9, Echinoidea, p. 82, pls. 15–17, 1881.

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Asthenosoma urens SARASIN, Ergebn. naturw. Forsch. Ceylon, vol. 1, pt. 3, 1888.
Asthenosoma heteractis BEDFORD, Proc. Zool. Soc. London, 1900, p. 278, pl. 21, fig. 2.

Localities.—Station 5136; in the vicinity of Jolo (Sulu); Jolo Light bearing S. 37° E., 0.7 mile distant (lat. 6°04′20″ N., long. 120°59′20″ E.); 40 meters; sand and shells; February 14, 1908. One specimen.

Station 5138; in the vicinity of Jolo; Jolo Light bearing S. 19° E., 2.5 miles distant (lat. 6°06′00″ N., long. 120°58′50″ E.); 35 meters; sand and coral; February 14, 1908. One specimen.

Station 5139; in the vicinity of Jolo; Jolo Light bearing S. 51° W., 3.6 miles distant (lat. 6°06′00″ N., long. 121°02′30″ E.); 36 meters; coral sand; February 14, 1908. One specimen.

Station 5141; in the vicinity of Jolo; Jolo Light bearing S. 17° E., 5.5 miles distant (lat. 6°09′00″ N., long. 120°58′00″ E.); 53 meters; coral sand; February 15, 1908. One specimen.

Station 5142; in the vicinity of Jolo; Jolo Light bearing S. 50° W., 3.9 miles distant (lat. 6°06′10″ N., long. 121°02′40″ E.); 38 meters; coral sand and shells; February 15, 1908. Two specimens.

Station 5144; in the vicinity of Jolo; Jolo Light bearing S. 50° W., 3.4 miles distant (lat. 6°05′00″ N., long. 121°02′15″ E.); 35 meters; coral sand; February 15, 1908. Two specimens.

Station 5146; Jolo (Sulu) Archipelago, in the vicinity of Siasi; Sulade Island (E.) bearing N. 18° W., 3.4 miles distant (lat. 5°46′40″ N., long. 120°48′50″ E.); 44 meters; coral sand and shells; February 16, 1908. One specimen.

Station 5147; Jolo Archipelago, in the vicinity of Siasi; Sulade Island (E.) bearing N. 3° E., 8.4 miles distant (lat. 5° 41′40″ N., long. 120°47′10″ E.); 38 meters; coral sand and shells; February 16, 1908. Two specimens.

Station 5148; Jolo Archipelago, in the vicinity of Siasi; Sirun Island (N.) bearing S. 80° W., 3.8 miles distant (lat. 5°35′40″ N., long. 120°47′30″ E.); 31 meters; coral sand; February 16, 1908. Twelve specimens.

Station 5149; in the vicinity of Siasi; Sirun Island (W.) bearing N. 39° E., 2.4 miles distant (lat. 5°33′00″ N., long. 120°42′10″ E.); 18 meters; coral and shells; February 18, 1908. Two specimens.

Station 5156; Tawi Tawi group, Jolo Archipelago; Tinakta Island (N.) bearing S. 77° W., 3.4 miles distant (lat. 5°12′50″ N., long. 119°55′55″ E.); 33 meters; fine sand and shells; February 21, 1908. One specimen.

Station 5218; between Burias and Luzon; Anima Sola Island (E.) bearing N. 10° W., 2 miles distant (lat. 13°11′15″ N., long. 123° 02′ 45″ E.); 37 meters; coarse sand; April 22, 1908. One small specimen.

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Remarks.—That the forms described under the names *Asthenosoma grubei*, *A. urens*, and *A. heteractis* are simply synonyms of *A. varium*, as has repeatedly been suggested, can no longer be doubted.

ASTHENOSOMA IJIMAI Yoshiwara

Asthenosoma ijimai **Yoshiwara, Annot. Zool. Japon., vol. 1, p. 8, pl. 2, figs. 8–12, 1897.—Mortensen, Ann. Mag. Nat. Hist., ser. 7, vol. 14, p. 87, pl. 3, figs. 1, 2; pl. 5, figs. 1–3, 10, 12–14, 1904; Monograph of the Echinoidea, vol. 2, p. 288, pl. 63; pl. 64; pl. 65, figs. 1, 2, 1935.**

Localities.—Station 5136; in the vicinity of Jolo (Sulu); Jolo Light bearing S. 37° E., 0.7 mile distant (lat. 6°04′20″ N., long. 120°59′20″ E.); 40 meters; sand and shells; February 14, 1908. One large specimen.

Station 5141; in the vicinity of Jolo; Jolo Light bearing S. 17° E., 5.5 miles distant (lat. 6°09′00″ N., long. 120°58′00″ E.); 53 meters; coral sand; February 15, 1908. One small specimen.

Station 5142; in the vicinity of Jolo; Jolo Light bearing S. 50° W., 3.9 miles distant (lat. 6°06′10″ N., long. 121°02′40″ E.); 38 meters; coral sand and shells; February 15, 1908. One specimen.

Station 5482; in the vicinity of Surigao Strait; Cabugan Grande Island (N.) bearing N. 87° W., 4.5 miles distant (lat. 10°27′30″ N., long. 125°18′00″ E.); 122 meters; broken shells, sand, and green mud; July 30, 1909. One large specimen.

Remarks.—This species having been hitherto recorded only from the Sagami Sea, Japan, it is of considerable zoogeographical interest that it has been found in the Philippine seas by the *Albatross*. I have also myself taken it there, off Jolo, in 1914, and later, in 1922, at the Kei Islands, which indicates that it will eventually be found to be widely distributed in the Malay Archipelago.

ASTHENOSOMA DILATATUM Mortensen

Asthenosoma dilatatum **Mortensen, Monograph of the Echinoidea, vol. 2, p. 292, pl. 65, figs. 3, 4; pl. 82, fig. 4; pl. 83, figs. 15–17, 1935.**

Locality.—Station 5142; in the vicinity of Jolo (Sulu); Jolo Light bearing S. 50° W., 3.9 miles distant (lat 6° 06′ 10″ N., long. 121° 02′ 40″ E.); 38 meters; coral sand and shells; February 15, 1908. One specimen.

Remarks.—This is a very young specimen, only 10 mm. in diameter. It differs from the type specimen in the much darker color of its spines, a difference that may, however, be due simply to preservation. The specimen, which has apparently been dried out, gives the impression of having assumed a darker color through having been preserved together with comatulids. As is explained in the reference given, the numbers of its coronal plates differ remark-

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ably from those of the type, so it is possible that it is really a different species; but as both the present specimen and the type are young it is impossible to decide whether this difference, and the difference in color, may perhaps in reality be specific differences. The highly characteristic pedicellariae, with delicate spoon-shaped valves, are alike in both.

Order STIRODONTA

Family SALENIIDAE

Genus SALENOCIDARIS A. Agassiz

SALENOCIDARIS HASTIGERA (A. Agassiz)

Salenia hastigera A. Agassiz, *Challenger* Reports, Zoology, vol. 3, pt. 9, Echinoidea, p. 54, pl. 4, figs. 3–17, 1881; Panamic deep-sea Echini, pl. 20, fig. 8, 1904.

Salenocidaris hastigera Mortensen, Monograph of the Echinoidea, vol. 2, p. 360, pl. 56, figs. 1–2; pl. 85, figs. 5–7, 31–33; pl. 86, figs. 17–20, 1935.

Locality.—Station 5601; Gulf of Tomini, Celebes; Limbe Island (NE.) bearing N., 20.7 miles distant (lat. 1°13′10″ N., long. 125° 17′05″E.); 1,398 meters; sand, globigerinae, and pteropods; November 13, 1909. One specimen.

Remarks.—In their Hawaiian and other Pacific Echini published in 1908, on page 58, Agassiz and Clark declare *Salenocidaris hastigera* identical with *S. profundi* (Duncan). This undoubtedly holds good for the Atlantic specimens identified as *S. hastigera*, but not for the specimens from the Indo-Malayan region, which are distinguished from the Atlantic form particularly by ocular I being exsert, even in the adult, whereas in the Atlantic *profundi* ocular I is broadly insert—except for the variety *occlusa* Mortensen, which has ocular I exsert like *hastigera*, from which species it differs, however, in other characters so as to be decidedly the nearer related to *profundi*.

Since in the preliminary report on the *Challenger* echinoids Agassiz mentions under his *Salenia hastigera* first the station 195, Banda Sea, the specimen from that station must be taken to represent the type specimen of *hastigera*, and the name *hastigera* is thus to be preserved for the form from the Indo-Malayan region.

SALENOCIDARIS HASTIGERA var. ACUMINATA Mortensen

Salenocidaris hastigera, var. *acuminata* Mortensen, Vid. Medd. Dansk Naturh. Foren., vol. 98, p. 166, 1934; Monograph of the Echinoidea, vol. 2, p. 363, pl. 85, fig. 14; pl. 86, figs. 11–13, 1935.

Locality.—Station 5614; Molucca Passage; Tifori Island (C.) bearing N. 19° E., 30.5 miles distant (lat. 0°31′00″ N., long. 125°58′45″ E.); 2,010 meters; gray mud, sand, and globigerinae; November 22, 1909. One specimen.

Remarks.—This specimen, which measures 9 mm. in horizontal diameter, differs from the typical *hastigera* in various points. The

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ambulacral spines are constricted in their distal part, being thus somewhat pointed and also somewhat longer than usual. Genital pores have not yet appeared, whereas in typical *hastigera* they are already fully developed at a size of 8 mm. horizontal diameter, which fact would tend to indicate that it reaches a larger size than the typical *hastigera*. The tridentate (and quadridentate) pedicellariae are different from those of typical *hastigera*, broader and more like those of *profundi*. Quadridentate pedicellariae have not been observed in *hastigera*. In the characters of the test and of the spines it otherwise resembles *hastigera*, and also the color is the same—a light purplish on the test and secondary spines, the primary spines as well as the denuded test being white.

I rather think that this form will ultimately prove to represent a distinct species. But with only one specimen at hand one cannot determine how constant the characters pointed out are, so it would seem the better course for the present to designate it simply as a variety of *hastigera*, to which species it is, at any rate, closely related. To identify it merely as *hastigera* I do not think justifiable.

Family ARBACIIDAE

Genus PYGMAEOCIDARIS Döderlein

PYGMAEOCIDARIS PRIONIGERA (A. Agassiz)

Podocidaris prionigera A. AGASSIZ, *Challenger* Reports, Zoology, vol. 3, pt. 9, Echinoidea, p. 59, pl. 34, figs. 14, 15, 1881.

Pygmaeocidaris prionigera DÖDERLEIN, Wiss. Ergebn. Tiefsee-Exped., vol. 5, Lief. 2, p. 185, pl. 22, fig. 2; pl. 29, fig. 6; pl. 35, fig. 4; pl. 45, fig. 5, 1906.—KOEHLER, *Investigator* Echinoidea, pt. 3, p. 63, pl. 11, figs. 7–9, 1927.—MORTENSEN, Monograph of the Echinoidea, vol. 2, p. 553, pl. 87, figs. 27–35, 1935.

Locality.—Station 5608; Gulf of Tomini, Celebes; Binang Unang Island (peak) bearing S. 87° E., 19 miles distant (lat. 0°08′00″ S., long. 121°19′00″ E.); 1,991 meters; bottom temperature 2.39° C.; gray mud; November 18, 1909. One specimen.

Remarks.—This specimen, 13 mm. in diameter, is a good deal larger than the other four specimens hitherto known, the largest of which was only 9.5 mm. in diameter.

Though not in the very best condition—the spines are nearly all broken—this specimen has afforded a very welcome opportunity for adding to our knowledge of this highly interesting rare deep-sea echinoid.

Curiously, the contents of the intestine were found to be only bits of land plants, which must have been washed out from the shore and sunk to the bottom to form the vegetarian diet of this small deep-sea echinoid as well as of so many of the echinothurids.

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Recalling that Döderlein found the primordial plate of this species to be divided into three parts lying in a vertical median series, as in the remarkable Triassic *Tiarechinus*, I must mention that in the one interambulacral area of the present specimen that has been denuded I find this plate undivided. The extraordinary fact that there are no genital pores in this specimen would seem to indicate that the genital pores are closed up after the shedding of the genital products. The idea that it might be a young individual with the genital pores not yet formed is opposed by the fact that genital pores are indicated as existing in the other smaller specimens known. But more extensive material is very much needed for settling this point.

Genus COELOPLEURUS L. Agassiz

COELOPLEURUS MACULATUS A. Agassiz and H. L. Clark

Coelopleurus maculatus A. Agassiz and H. L. Clark, Bull. Mus. Comp. Zool., vol. 51, p. 116, 1907; Hawaiian and other Pacific Echini, Salenidae, etc., p. 84, pl. 49, figs. 21–28; pl. 53, figs. 1–7; pl. 57, figs. 4–6, 1908.—Mortensen, Monograph of the Echinoidea, vol. 2, p. 631, pl. 67, fig. 4; pl. 68, figs. 1–3; pl. 69, figs. 10–16; pl. 88, figs. 26–29, 1935.

Localities.—Station 5217; between Burias and Luzon; Anima Sola Island bearing N. 42° W., 17.3 miles distant (lat. 13°20′00″ N., long. 123°14′15″ E.); 192 meters; bottom temperature 17.28° C.; coarse gray sand; April 22, 1908. One specimen.

Station 5415; between Cebu and Bohol; Lauis Point Light bearing N. 24° W., 7.2 miles distant (lat. 10°07′50″ N., long. 123°57′00″ E.); 161 meters; bottom temperature 16.89° C.; fine sand; March 24, 1909. Two specimens.

Station 5617; Dodinga Bay, Gillolo; Ternate Island (SE.) bearing S. 45° W., 7 miles distant (lat. 0°49′30″ N., long. 127°25′30″ E.); 239 meters; coral; November 27, 1909. One specimen.

Remarks.—In his "Catalogue of the Recent Sea-Urchins of the British Museum," published in 1925, on page 73, Dr. H. L. Clark comes to the conclusion that *Coelopleurus maculatus* is identical with *C. elegans* (Bell). I cannot agree with this. The valves of the ophicephalous pedicellariae of *C. elegans* are conspicuously different from those of *C. maculatus*, and since the ophicephalous pedicellariae within the genus *Coelopleurus* afford important specific differences, the character of the ophicephalous pedicellariae alone forbids regarding *elegans* and *maculatus* as identical. It appears also that *C. elegans* has none of the club-shaped secondary spines on the aboral side so characteristic of *C. maculatus*. On the whole it is clear that *C. elegans* stands much nearer to *C. maillardi* than to *C. maculatus*, and it is quite probable even that it is identical with *C. maillardi*, of which the name *elegans* would then be simply a synonym.

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COELOPLEURUS MAILLARDI (Michelin)

Keraiophorus maillardi MICHELIN, Échinides et stellérides, *in* Maillard, Notes sur l'île de la Réunion, Annexe A, p. 2, pl. 14, 1862.

Coelopleurus maillardi A. AGASSIZ and H. L. CLARK, Hawaiian and other Pacific Echini, Salenidae, etc., p. 84, pl. 49, fig. 34; pl. 53, figs. 8, 9, 1908.—MORTENSEN, Monograph of the Echinoidea, vol. 2, p. 627, pl. 67, fig. 3; pl. 68, fig. 4; pl. 69, figs. 1–3; pl. 88, figs. 22, 23, 1935.

Localities.—Station 5108; China Sea, off southern Luzon; Corregidor Light bearing N. 39° E., 22.5 miles distant (lat. 14°05′05″ N., long. 120°19′45″ E.); 23 meters; coral; January 15, 1908. One specimen.

Station 5413; between Cebu and Bohol; Lauis Point Light bearing N. 68° W., 10 miles distant (lat. 10°10′35″ N., long 124°03′15″ E.); 77 meters; March 24, 1909. One specimen.

Station 5483; between Samar and Leyte, in the vicinity of Surigao Strait; Cabugan Grande Island (N.) bearing N. 88° W., 5.7 miles distant (lat. 10° 27′ 30″ N., long. 125°19′15″ E.); 135 meters; sand and broken shells; July 30, 1909. Three specimens.

Remarks.—All the specimens are young and not very well preserved.

COELOPLEURUS LONGICOLLIS A. Agassiz and H. L. Clark

Coelopleurus maillardi (in part) A. AGASSIZ, *Challenger* Reports, Zoology, vol. 3, pt. 9, Echinoidea, p. 61, pl. 5; pl. 6; pl. 45, figs. 1–6, 1881.

Coelopleurus longicollis A. AGASSIZ and H. L. CLARK, Hawaiian and other Pacific Echini, Salenidae, etc., p. 89, pl. 49, figs. 29–30; pl. 53, fig. 10, 1908.—MORTENSEN, Monograph of the Echinoidea, vol. 2, p. 619, pl. 67, figs. 7–9; pl. 88, figs. 19–21, 1935.

Locality.—Station 5392; between Samar and Masbate; Tubig Point bearing N. 49° E., 5 miles distant (lat. 12°12′35″ N., long. 124°02′48″ E.); 247 meters; green mud and sand; March 13, 1909. One specimen.

Remarks.—This specimen has been made the subject of a detailed description in my Monograph of the Echinoidea, the species having never before been duly described, since in the *Challenger* report it was mixed up with *C. maculatus* (both the species being erroneously identified as *C. maillardi* by Agassiz), and in the Hawaiian Echini only the pedicellariae were described and figured. The *Albatross* specimen thus is of considerable value, forming the base of the description of this species. That it is really identical with the *C. longicollis* of Agassiz and Clark would seem beyond doubt, the characteristic ophicephalous pedicellariae distinguishing this species from all other species of *Coelopleurus* except *C. australis* H. L. Clark, which is evidently very closely related to *C. longicollis*. In the absence of sufficient illustrations of *C. australis* it is not easy to judge of how close the relationship is. If they should ultimately turn out to be identical, it is the name *longicollis*, as the older, that must prevail, so it would not alter the name of the *Albatross* specimen.

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Order AULODONTA

Family ASPIDODIADEMATIDAE

Genus PLESIODIADEMA Pomel

PLESIODIADEMA INDICUM (Döderlein)

Dermatodiadema indicum DÖDERLEIN, Zool. Anz., vol. 23, p. 21, 1901.—DE MEIJERE, *Siboga* Echinoidea, p. 46, pl. 3, fig. 23, 1904.—DÖDERLEIN, Wiss. Ergebn. Tiefsee-Exped., vol. 5, Lief, 2, p. 158, pl. 20, figs. 2, 3; pl. 41, fig. 2, 1906.—MORTENSEN, Vid. Medd. Dansk Naturh. Foren., vol. 76, p. 65, fig. 2, 1923.

Localities.—Station 5440; west coast of Luzon; San Fernando Point Light bearing N. 82° E., 23.1 miles distant (lat. 16°33′52″ N., long. 119°52′54″ E.); 314 meters; bottom temperature 11.78° C.; fine gray sand and globigerinae; May 10, 1909. One small specimen.

Station 5625; between Gillolo and Kayoa Islands; Kayoa Island (SE.) bearing S. 3° W., 6 miles distant (lat. 0°07′00″ N., long 127°28′00″ E.); 240 meters; gray mud and fine sand; November 29, 1909. Seven specimens.

Remarks.—The specimens from station 5625 are all of about the same size, about 30–32 mm. in horizontal diameter. None of them have any of the primary spines intact. In one of them the fairly well preserved aboral spines, which form the usual erect tuft, are of a light purplish color.

The specimen from station 5440 is only about 11 mm. in horizontal diameter and is by far the youngest specimen known. It already has spines on the buccal plates, and the genital pores have just appeared.

In some of the large specimens from station 5625 that I opened I found a good number of a very peculiar entoparasitic halacarid, which has recently been described by Dr. Karl Viets [6] under the name *Enterohalacarus minutipalpus*—the only case as yet known of a truly entoparasitic halacarid.

These specimens likewise disclosed the interesting fact that this deep-sea species prefers a vegetarian diet, the intestine being full of small bits of plants, apparently land plants, carried out to sea, where they have sunk to the bottom to form the staple food of deep-sea echinoids.

PLESIODIADEMA AMPHIGYMNUM (de Meijere)

Dermatodiadema amphigymnum DE MEIJERE, *Siboga* Echinoidea, p. 47, pl. 14, figs. 195–202, 1904.

Locality.—Station 5654; Gulf of Boni, Celebes; Cape Tabako bearing N. 17° E., 21.5 miles distant (lat. 3°42′00″ S., long. 120°45′50″ E.); 1,471 meters; December 18, 1909. One specimen.

[6] Zeitschr. für Parasitenk., vol. 10, pt. 2, pp. 210–216, 1938.

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Remarks.—The specimen is only 10 mm. in horizontal diameter, though evidently adult, having large genital pores covered by long genital papillae. Although in very poor condition this specimen, the only one found since the *Siboga* expedition, is of considerable importance, affording proof that *P. amphigymnum* is not identical with the west American *P. horridum* as maintained by Agassiz and Clark. It is, no doubt, closely related to that species but differs markedly from it in the almost total absence of plates on the periproct, in the structure of the spines, and in the character of the ophicephalous pedicellariae. Also, it appears to reach only a much smaller size than the west American species.

Genus ASPIDODIADEMA A. Agassiz

ASPIDODIADEMA TONSUM A. Agassiz

Aspidodiadema tonsum A. Agassiz, *Challenger* Reports, Zoology, vol. 3, pt. 9, p. 66, pl. 8, figs. 1–9, 1881.—de Meijere, *Siboga* Echinoidea, p. 44, pl. 13, figs. 177–182, 1904.—Mortensen, The Danish Expedition to Siam 1899–1900, pt. 2, Echinoidea, p. 34, pl. 3, fig. 26; pl. 5, figs. 6, 31, 1904.—A. Agassiz and H. L. Clark, Hawaiian and other Pacific Echini, Salenidae, etc., p. 98, pl. 50, figs. 3–5, 1908.

Locality.—Station 5348; Palawan passage; Point Tabonan bearing S. 89° E., 33.5 miles distant (lat. 10°57′45″ N., long. 118°38′15″ E.); 685 meters; bottom temperature 13.56° C.; coral sand; December 27, 1908. Twenty specimens.

Remarks.—These specimens, ranging in size from 14 to 21 mm. in horizontal diameter, are all in rather poor condition and almost devoid of spines. In one of them, however, the basal 20 to 25 mm. of some of the aboral primary spines are preserved, enough to show that the spines of this species are curved as in other aspidodiadematids. One of the specimens shows distinct traces of a purplish color.

A specimen that was opened was found to contain only balls of mud, with Foraminifera and sponge spicules, in its intestinal canal. No ecto- or entoparasites were found with any of the specimens.

Family MICROPYGIDAE

Genus MICROPYGA A. Agassiz

MICROPYGA TUBERCULATA A. Agassiz

Micropyga tuberculata A. Agassiz, *Challenger* Reports, Zoology, vol. 3, pt. 9, p. 68, pl. 7, 1881.—de Meijere, *Siboga* Echinoidea, p. 59, pl. 14, fig. 215; pl. 15, figs. 216–231, 1904.—Döderlein, Wiss. Ergebn. Tiefsee-Exped., vol. 5, Lief. 2, p. 169, pl. 21, fig. 4; pl. 42, figs. 1–6; pl. 43, figs. 1–18; pl. 44, fig. 1, 1906.—H. L. Clark, Catalogue of the recent sea-urchins in the British Museum, p. 48, 1925.

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Localities.—Station 5115; Verde Island passage; Sombrero Island bearing N. 49° E., 7.3 miles distant (lat. 13°37′11″ N., long. 120° 43′40″ E.); 622 meters; January 20, 1908. One specimen.

Station 5117; Verde Island passage; Sombrero Island bearing S. 17° E., 10.8 miles distant (lat. 13°52′22″ N., long. 120°46′22″ E.); 216 meters; January 21, 1908. One specimen.

Station 5118; Verde Island passage; Sombrero Island bearing S. 47° E., 10 miles distant (lat. 13°48′45″ N., long. 120°41′51″ E.); 291 meters; dark green mud; January 21, 1908. One specimen.

Station 5122; east coast of Mindoro; Malabrigo Light bearing N. 46° W., 20.6 miles distant (lat. 13°21′30″ N., long. 120°30′33″ E.); 402 meters; green mud; February 2, 1908. One specimen.

Station 5172; in the vicinity of Jolo (Sulu); Jolo Light bearing E. 24.75 miles distant (lat. 6°03′15″ N., long. 120°35′30″ E.); 581 meters; fine sand and shells; March 5, 1908. Three specimens.

Station 5198; in the vicinity of western Bohol; Baliscasag Island bearing S. 6° E., 10.25 miles distant (lat. 9°40′50″ N., long. 123° 39′45″ E.); 402 meters; bottom temperature 12.17° C.; green mud; April 9, 1908. Five specimens.

Station 5241; Pujada Bay and vicinity; Uanivan Island (N.) bearing S. 68° E., 3 miles distant (lat. 6°50′45″ N., long. 126°14′38″ E.); 393 meters; soft gray mud; May 14, 1908. Five specimens.

Station 5242; in the vicinity of Pujada Bay; Uanivan Island (N.) bearing S. 56° E., 4 miles distant (lat. 6°51′53″ N., long. 126° 14′10″ E.); 349 meters; bottom temperature 17.83° C.; soft gray mud. Three specimens.

Station 5243; in the vicinity of Pujada Bay; Uanivan Island (N.) bearing S. 66° E., 3.1 miles distant (lat. 6°50′55″ N., long. 126° 14′35″ E.); 398 meters; bottom temperature 17.56° C.; gray mud; May 15, 1908. Five specimens.

Station 5244; in the vicinity of Pujada Bay; Uanivan Island (N.) bearing S. 52°30′ E., 4 miles distant (lat. 6°52′05″ N., long. 126° 14′15″ E.); 313 meters; gray mud; May 15, 1908. One specimen.

Station 5411; between Cebu and Bohol; Lauis Point Light bearing N. 35° E., 4.7 miles distant (lat. 10°10′30″ N., long. 123°51′15″ E.); 265 meters; bottom temperature 12.89° C.; green mud; March 23, 1909. Two specimens.

Station 5412; between Cebu and Bohol; Lauis Point Light bearing N. 21° E., 5.5 miles distant (lat. 10°09′15″ N., long. 123°52′00″ E.); 296 meters; bottom temperature 12.67° C.; green mud; March 23, 1909. Two specimens.

Station 5415; between Cebu and Bohol; Lauis Point Light bearing N. 24° W., 7.3 miles distant (lat. 10°07′50″ N., long. 123°57′00″ E.); 161 meters; bottom temperature 16.89° C.; fine sand; March 24, 1909. Four specimens.

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Station 5418; between Cebu and Bohol; Lauis Point Light bearing N. 16° E., 5.6 miles distant (lat. 10°08′50″ N., long. 123°52′30″ E.); 291 meters; bottom temperature 12.44° C.; gray mud and sand; March 25, 1909. Eight specimens.

Station 5420; between Cebu and Bohol; Cruz Point, Bohol, bearing S. 20° E., 6 miles distant (lat. 9°49′35″ N., long. 123°45′00″ E.); 232 meters; March 25, 1909. One specimen.

Station 5453; east coast of Luzon; Legaspi Light bearing S. 58° W., 4.5 miles distant (lat. 13°12′00″ N., long. 123°49′18″ E.); 267 meters; June 7, 1909. Four specimens.

Station 5501; in the vicinity of northern Mindanao; Macabalan Point Light, Mindanao, bearing S. 35° E., 8.2 miles distant (lat. 8°37′37″ N., long. 124°35′00″ E.); 391 meters; bottom temperature 12.39° C.; fine sand and gray mud; August 4, 1909. One specimen.

Station 5516; in the vicinity of northern Mindanao; Point Tagolo Light, Mindanao, bearing S. 80° W., 9.7 miles distant (lat. 8°46′00″ N., long. 123°32′30″ E.); 319 meters; bottom temperature 12.39° C.; globigerinae; August 9, 1909. Six specimens.

Station 5536; between Negros and Siquijor; Apo Island (C.) bearing S. 26° W., 11.8 miles distant (lat. 9°15′45″ N., long. 123°22′00″ E.); 510 meters; bottom temperature 11.95° C.; green mud; August 19, 1909. One young specimen.

Station 5537; between Negros and Siquijor; Apo Island (C.) bearing S. 46° W., 8.7 miles distant (lat. 9°11′00″ N., long. 123°23′00″ E.); 464 meters; bottom temperature 11.94° C.; green mud; August 19, 1909. One specimen.

Station 5565; between Jolo and Tawi Tawi; Dammi Island (N.) bearing S. 69° W., 6 miles distant (lat 5°51′42″ N., long. 120°30′30″ E.); 444 meters; bottom temperature 11.28° C.; sand and pteropod shells; September 21, 1909. Three specimens.

Station 5589; Sibuko Bay, Borneo; Mabul Island (NW.) bearing N. 3° W., 2.8 miles distant (lat. 4°12′10″ N., long. 118°38′08″ E.); 475 meters; bottom temperature 7.61° C.; fine gray sand and gray mud; September 29, 1909. Three specimens.

Station 5622; between Gillolo and Makyan Islands; Makyan Island (NE.) bearing N. 66° W., 4.1 miles distant (lat. 0°19′20″ N., long. 127°28′30″ E.); 503 meters; gray mud; November 29, 1909. Four specimens.

Station 5625; between Gillolo and Kayoa Islands; Kayoa Island (SE.) bearing S. 3° W., 6 miles distant (lat. 0°07′00″ N., long. 127°28′00″ E.); 420 meters; gray mud and fine sand; November 29, 1909. Two specimens.

Station 5645; in Buton Strait; North Island (NE.) bearing S. 10° W., 1.6 miles distant (lat. 5°29′06″ S., long. 122°36′06″ E.); 377 meters; December 16, 1909. One specimen.

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Remarks.—None of these specimens exceed a size of 140 mm. in diameter. This is also the case with the several specimens that I have myself collected in the Philippine Sea and at the Kei Islands.

In Dr. H. L. Clark's Catalogue of the Recent Sea-Urchins in the British Museum the *Challenger* specimens are stated to range from 26 to 120 mm. in diameter. Döderlein's and de Meijere's largest specimens were, respectively, 115 and 130 mm. in diameter. It may then rather safely be said that Agassiz's statement that this species reaches a size of 200 mm. in diameter must be a mistake—probably a misprint for 120 mm.

The specimens at hand, some of which are in good and others in poor condition, are in general quite typical examples of this species, although in the specimens from stations 5241, 5242, 5243, and 5245 the spines of the aboral side are more slender and the tubercles correspondingly smaller, which makes them look somewhat different from the typical coarse-spined form. I do not, however, find any other characters distinguishing these specimens from the typical form, so that I must regard them as belonging to this same species, possibly representing a local race, though scarcely characteristic enough to be distinguished as a separate variety.

The specimens from station 5415 are red-brown, the others more dark purple, or nearly black—if not faded, as is the case with the specimens from station 5625. As they do not differ in any other way from the darker specimens, they must likewise be regarded as true *M. tuberculata.*

One of the specimens from station 5415 and some of those from station 5516 are interesting in carrying on their oral side examples of the epizoic ophiuran *Ophiosphaera*, all of them with the oral side turned away from the sea-urchin. Evidently this is a new species, but like *O. insignis* it carries the male on the oral side, covering the mouth of the female specimen and the arms of the female alternating with those of the male.

As was found to be the case with several species among the echinothurids, *Micropyga tuberculata* feeds largely on plant remains, from both phanerogams and algae, that have sunk to the bottom of the sea. But other bottom material also may form part of its diet.

MICROPYGA VIOLACEA de Meijere

Micropyga violacea DE MEIJERE, *Siboga* Echinoidea, p. 63, pl. 4, figs. 29, 30; pl. 15, figs. 232–234, 1904.

Localities.—Station 5114; Verde Island passage; Sombrero Island bearing N. 36° E., 7.2 miles distant (lat. 13°36′11″ N., long.

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120°45'26" E.); 622 meters; fine sand; January 20, 1908. One specimen.

Station 5115; Verde Island passage; Sombrero Island bearing N. 49° E., 7.3 miles distant (lat. 13°37'11" N., long. 120°43'40" E.); 622 meters; January 20, 1908. Two specimens.

Station 5284; China Sea, in the vicinity of southern Luzon; Malavatuan Island (S.) bearing N. 46° W., 14.25 miles distant (lat. 13°42'05" N., long. 120°30'45" E.); 771 meters; bottom temperature 5.72° C.; gray mud and globigerinae; July 20, 1908. Three specimens.

Station 5467; off the east coast of Luzon; Atulayan Island (S.) bearing S. 79° W., 2.5 miles distant (lat. 13°35'27" N., long. 123°37'18" E.); 877 meters; gray mud; June 18, 1909. Six specimens.

Station 5586; Sibuko Bay, Borneo; Sipadan Island (M.) bearing W., 9.4 miles distant (lat. 4°06'50" N., long. 118°47'20" E.); 634 meters; bottom temperature 6.67° C.; gray mud; September 28, 1909. One young specimen.

Station 5656; Gulf of Boni, Celebes; Olang Point bearing N. 67° W., 14.5 miles distant (lat. 3°17'40" S., long. 120°36'45" E.); 871 meters; gray mud; December 19, 1909. Three specimens.

Remarks.—All these specimens are in rather poor condition, more or less broken, this species being very delicate and fragile, much more so than the other species, *M. tuberculata*. Only a very few of the club-shaped oral primary spines, or of the umbrella-shaped tube-feet, are preserved, though enough to show that they are found in this species exactly as in *M. tuberculata*, which de Meijere could not determine in his single specimen.

Recently this species has been taken by the John Murray Expedition off the east African coast, which shows that the species is not confined to the Malay region, but must be distributed also all over the tropical part of the Indian Ocean.

Family DIADEMATIDAE

Genus ASTROPYGA Gray

ASTROPYGA RADIATA (Leske)

Astropyga radiata A. Agassiz, Revision of the Echini, pt. 1 [Mem. Mus. Comp. Zool., vol. 3], p. 94, 1872; pt. 3, p. 420, 1873.—Döderlein, Jenaische Denkschr., vol. 8, p. 699, pl. 59, figs. 6, 7, 1902.—Mortensen, The Danish Expedition to Siam 1899–1900, II. Echinoidea [Danske Selsk. Skr., ser. 7, vol. 1, No. 1], p. 18, pl. 3, figs. 15, 19; pl. 4, figs. 9, 17; pl. 5, fig. 27, 1904.

Locality.—Sirinao Island (SW.), Nakoda Bay, Palawan; December 30, 1908. Three large specimens.

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Genus EREMOPYGA A. Agassiz and H. L. Clark

EREMOPYGA DENUDATA (de Meijere)

Astropyga denudata DE MEIJERE, *Siboga* Echinoidea, p. 57, pl. 4, figs. 31, 32; pl. 14, figs. 209–214, 1904.

Eremopyga denudata A. AGASSIZ and H. L. CLARK, Hawaiian and other Pacific Echini, Salenidae, etc., p. 122, 1908.

Localities.—Station 5140; in the vicinity of Jolo (Sulu); Jolo Light bearing S. 33° W., 6.1 miles distant (lat. 6°08′45″ N., long. 121°03′00″ E.), 139 meters; fine coral sand; February 14, 1908. One specimen.

Station 5448; east coast of Luzon; San Miguel Point bearing N. 23° E., 1.5 miles distant (lat. 13°23′10″ N., long 123°45′19″ E.); 86 meters; June 4, 1909. Two specimens.

Remarks.—Apart from some breakage of the test in the specimen from off Jolo these specimens are well preserved. The two from station 5448 are only half grown, about 45 mm. in horizontal diameter, but the genital pores are fully developed.

The label of the specimen from station 5140 states: "General color dark claret, lines of brilliant purple on ambulacral [should be interambulacral] area, 5 spots of same around periproct."

EREMOPYGA DEBILIS, new species

Characters.—This new species differs very conspicuously from the only other species of the genus *Eremopyga* known till now, *E. denudata*, in the tubercles being very suddenly reduced in the proximal half of the oral side so as to produce an appearance much like that of *Chaetodiadema*. That the species does not, however, belong to *Chaetodiadema* appears very clearly from the character of the ambulacra, the tubefeet being well developed and the pores arranged in the usual arcs of three up to the edge of the peristome. Also the structure of the spines is as in *E. denudata*.

The primary interambulacral tubercles are almost confined to the ambitus, there being only 5–7 tubercles in the outer adradial series. In the median area four series of large tubercles occur in the largest specimens, the two median series placed close together along the midline of the area.

The whole aboral side is very naked. The blue spots in the naked bifurcating interambulacral area are small, isolated spots, or are united into a vertical line. The apical system has oculars II and III, sometimes also ocular IV, exsert.

The test appears to be of a much more delicate structure than that of *E. denudata*, and all the specimens are more or less crushed. But it is clear that the normal shape is in the main like that of *E. denudata*, only it is not sunken at the peristomial edge or apically, and the ambulacra are not raised on the aboral side.

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The color of the preserved specimens is a uniform dirty-gray mud-color, but it seems evident that this is due to the poor preservation.

Localities.—Station 5241; in the vicinity of Pujada Bay; Uanivan Island (N.) bearing S. 68° E., 3 miles distant (lat. 6°50′45″ N., long. 126°14′38″ E.); 393 meters; soft gray mud; May 14, 1908. Two young specimens.

Station 5242; in the vicinity of Pujada Bay; Uanivan Island (N.) bearing S. 56° E., 4 miles distant (lat. 6°51′53″ N., long. 126°14′10″ E.); 349 meters; bottom temperature 17.83° C.; soft gray mud; May 14, 1908. Five specimens.

Station 5243; in the vicinity of Pujada Bay; Uanivan Island (N.) bearing S. 66° E., 3.1 miles distant (lat. 6°50′55″ N., long. 126°14′35″ E.); 398 meters; bottom temperature 17.56° C.; gray mud; May 15, 1908. Four specimens.

Station 5244; in the vicinity of Pujada Bay; Uanivan Island (N.) bearing S. 52°30′ E., 4 miles distant (lat. 6°52′05″ N., long. 126°14′15″ E.); 313 meters; gray mud; May 15, 1908. Four specimens.

Remarks.—All these specimens are in a rather poor state of preservation; the two young specimens from station 5241 are in very poor condition.

A more detailed description, accompanied by the necessary illustrations, will be given in the Monograph of the Echinoidea, vol. 3, pt. 1.

It is interesting to find this new species at the same localities, off Uanivan Island, where also the above mentioned peculiar form of *Micropyga tuberculata* was found. But whereas the latter was scarcely sufficiently characterized for being regarded as more than a local race, the *Eremopyga* specimens are so well characterized that they must decidedly rank as a distinct species.

Genus CHAETODIADEMA Mortensen

CHAETODIADEMA GRANULATUM Mortensen

Chaetodiadema granulatum Mortensen, The Danish Expedition to Siam 1899–1900, II. Echinoidea [Danske Selsk. Skr., ser. 7, vol. 1, No. 1], p. 22, pl. 1, figs. 1, 3, 21, 22; pl. 3, fig. 11; pl. 4, figs. 1, 4, 13–15, 24, 32; pl. 5, figs. 10, 18, 19, 22, 35, 1904.—de Meijere, *Siboga* Echinoidea, p. 54, pl. 3, fig. 28; pl. 11, fig. 101; pl. 14, figs. 205–208, 1904.—H. L. Clark, Catalogue of the recent sea-urchins in the British Museum, p. 50, 1925.

Localities.—Station 5103; China Sea, off southern Luzon; Calaclan Point bearing S. 86° E., 2.5 miles distant (lat. 14°49′30″ N., long. 120°13′30″ E.); 37 meters; gray mud; January 7, 1908. Six specimens.

Station 5182; off eastern Panay; Antonia Island (S.) bearing N. 43° W., 3.7 miles distant (lat. 11°30′40″ N., long. 123°23′20″ E.); 44 meters; mud and fine sand; March 27, 1908. One large specimen.

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Station 5220; between Marinduque and Luzon; San Andreas Island (W.) bearing S. 57° W., 8.5 miles distant (lat. 13°38′00″ N., long. 121°58′00″ E.); 91 meters; soft green mud; April 24, 1908. One specimen.

Station 5342; Halampaya Sound, Palawan; Endeavor Point (S.) bearing S. 58° E., 0.5 miles distant (lat. 10°56′55″ N., long. 119°17′24″ E.); 26–46 meters; gray mud; December 23, 1908. One young specimen.

Station 5358; Jolo (Sulu) Sea; Sandakan Light bearing S. 34° W., 19.7 miles distant (lat. 6°06′40″ N., long. 118°18′15″ E.); 71 meters; mud; January 7, 1909. Seven specimens.

Station 5360; in Iloilo Strait; Corregidor Light bearing N. 74° W., 6.9 miles distant (lat. 14°21′ N., long. 120°41′00″ E.); 22 meters; hard bottom; February 7, 1909. Eleven young specimens.

Station 5442; west coast of Luzon; San Fernando Point Light bearing N. 39° E., 8.4 miles distant (lat. 16°30′36″ N., long. 120°11′06″ E.); 82 meters, coral sand; May 10, 1909. Six young specimens.

Station 5477; between Samar and Leyte, in the vicinity of Surigao Strait; Tacbuc Point, Leyte, bearing S. 87° W., 11 miles distant (lat. 10°44′45″ N., long. 125°12′30″ E.); 88 meters; gray mud; July 29, 1909. One young specimen.

Remarks.—The specimen from station 5182 is no less than 120 mm. in horizontal diameter and is the largest specimen known of this species. The "bearded" part of the oral side is very large, the primary tubercles being confined to a narrow zone distally.

The specimens from station 5103 are somewhat darker than usual, perhaps colored by comatulids; in life the color evidently was the usual, the label stating "ten lines of sapphire spots in interambulacral areas, on brown dorsal surface, below white."

Parasite.—Two of the small specimens from stations 5358 and 5360 carry a small parasitic gastropod (?*Mucronalia*).

Genus DIADEMA Gray

DIADEMA SETOSUM (Leske)

Diadema saxatile Mortensen, The Danish Expedition to Siam 1899–1900, II. Echinoidea [Danske Selsk. Skr., ser. 7, vol. 1, No. 1], p. 9, pl. 3, figs. 22, 23, 29; pl. 4, figs. 26, 31, 34; pl. 5, figs. 2, 5, 8, 12, 14, 15, 1904.

Diadema setosum A. Agassiz and H. L. Clark, Hawaiian and other Pacific Echini, Salenidae, etc., p. 113, 1908.—H. L. Clark, Catalogue of the recent sea-urchins in the British Museum, p. 43, 1925.

Localities.—Tataan, Simulac Island; marginal coral reef; February 19, 1908. One young specimen.

San Pascual, Burrios Island; tide pool; March 8, 1909. One young specimen.

Jolo (Sulu); shore; June 3, 1908. One fine young specimen.

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Station 5159; Tawi Tawi group, Jolo Archipelago; Tinakta Island (N.) bearing N. 82° W., 1.4 miles distant (lat. 5°11′50″ N., long. 119°54′00″ E.); 18 meters; coral sand; February 21, 1908. One young specimen, not with certainty identifiable as to the species.

Station 5108; China Sea, off southern Luzon; Corregidor Light bearing N. 39° E., 22.5 miles distant (lat. 14°05′05″ N., long. 120°19′ 45″ E.); 23 meters; coral bottom; January 15, 1908. Two specimens.

DIADEMA SAVIGNYI Michelin

Diadema savignyi MORTENSEN, The Danish Expedition to Siam 1899–1900, II. Echinoidea [Danske Selsk. Skr., ser. 7, vol. 1, No. 1], p. 16, pl. 3, figs. 6, 8; pl. 4, fig. 37; pl. 5, figs. 7, 9, 24, 1904.—A. AGASSIZ and H. L. CLARK, Hawaiian and other Pacific Echini, Salenidae, etc., p. 114, 1908.—H. L. CLARK, Catalogue of the recent sea-urchins in the British Museum, p. 43, 1925.

Localities.—Station 5149; in the vicinity of Siasi; Sirun Island (W.) bearing N. 39° E., 2.4 miles distant (lat. 5°33′00″ N., long. 120°42′10″ E.); 18 meters; coral and shells; February 18, 1908. One young specimen in poor condition.

No label. Two specimens.

Genus ECHINOTHRIX Peters

ECHINOTHRIX CALAMARIS (Pallas)

Echinothrix calamaris A. AGASSIZ, Revision of the Echini, pt. 3 [Mem. Mus. Comp. Zool., vol. 3], p. 413, pl. 3a, figs. 1, 2, 1873.—H. L. CLARK, Catalogue of the recent sea-urchins in the British Museum, p. 44, 1925.

Localities.—Station 5138; in the vicinity of Jolo (Sulu); Jolo Light bearing S. 19° E., 2.5 miles distant (lat. 6°06′00″ N., long. 120°58′50″ E.); 37 meters; sand, shells, and coral; February 14, 1908. One small specimen.

Station 5142; in the vicinity of Jolo; Jolo Light bearing S. 50° W., 3.9 miles distant (lat. 6°06′10″ N., long 121°02′40″ E.); 38 meters; coral sand and shells; February 15, 1908. One specimen.

Station 5148; Jolo Archipelago, in the vicinity of Siasi; Sirun Island (N.) bearing S. 80° W., 3.8 miles distant (lat. 5°35′40″ N., long 120°47′30″ E.); 31 meters; coral sand; February 16, 1908. One large specimen.

Station 5149; in the vicinity of Siasi; Sirun Island (W.) bearing N. 39° E., 2.4 miles distant (lat. 5°33′00″ N., long. 120°42′10″ E.); 18 meters; coral and shells; February 18, 1908. Three specimens, one of them large.

Station 5159; Tawi Tawi group, Jolo Archipelago; Tinakta Island (N.) bearing N. 82° W., 1.4 miles distant (lat. 5°11′50″ N., long. 119°54′00″ E.); 18 meters; coral sand; February 21, 1908. One small specimen.

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Bubuan Island, near Jolo; coral masses; February 14, 1908. One specimen.

Remarks.—With the exception of the one from station 5142, and that from Bubuan Island, these specimens are all poorly preserved. They call for no descriptive remarks. The specimen from station 5148 is a very large one, 114 mm. in diameter, and as denuded makes a splendid specimen, of perfectly typical shape and structure.

Family PEDINIDAE

Genus CAENOPEDINA A. Agassiz

CAENOPEDINA ANNULATA, new species

Characters.—This new species bears a considerable general resemblance to the Japanese species *C. mirabilis* (Döderlein), but its primary spines are much more banded than in the latter—12 to 14 narrow, well-delimited reddish-brown bands on a greenish-white ground color. The characters of the test are as in *C. mirabilis*, but the genital plates offer a conspicuous character in the rather numerous tubercles (spines) being arranged in an inner and an outer band, separated by a broad, naked belt. The ophicephalous pedicellariae of the test are unique among the species of *Caenopedina* in having a very short broad blade, without any stalklike constriction at the base. The small tridentate pedicellariae have a characteristic widening of the edge in the basal part of the blade. The large form of tridentate pedicellariae was not found in the specimens at hand. The other pedicellariae are of the form usual in *Caenopedina.*

A full description and figures will be published in vol. 3, pt. 1, of my Monograph of the Echinoidea.

Localities.—Station 5617; Dodinga Bay, Gillolo; Ternate Island (SE.) bearing S. 45° W., 7 miles distant (lat. 0°49′30″ N., long. 127°25′30″ E.); 239 meters; coral; November 27, 1909. One fine specimen 31 mm. in horizontal diameter—the holotype.

Station 5168; Tawi Tawi group, Jolo (Sulu) Archipelago; Observation Island bearing N. 17° W., 4.2 miles distant (lat. 4°56′30″ N., long. 119°45′40″ E.); 146 meters; coral sand; February 25, 1908. One specimen 22 mm. in diameter.

CAENOPEDINA INDICA (de Meijere)

Hemipedina indica DE MEIJERE, *Siboga* Echinoidea, p. 65, pl. 3, fig. 27; pl. 15, fig. 235; pl. 16, figs. 236–242, 1904.

Caenopedina indica H. L. CLARK, Hawaiian and other Pacific Echini, Pedinidae, etc., p. 217, 1912.

Localities.—Station 5259; off northwestern Panay; Caluya Island (S.) bearing S. 73° W., 12 miles distant (lat. 11°57′30″ N., long.

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121°42′15″ E.); 570 meters; bottom temperature 9.61° C.; gray mud and globigerinae; June 3, 1908. One specimen.

Station 5282; China Sea, in the vicinity of southern Luzon; Malavatuan Island (N.) bearing S. 84° W., 6.2 miles distant (lat. 13°53′00″ N., long. 120°26′45″ E.); 453 meters; bottom temperature 8.56° C.; dark gray sand; July 18, 1908. One specimen.

Station 5325; off northern Luzon; Hermanos Island (N.) bearing N. 86° E., 16.75 miles distant (lat. 18°34′15″ N., long. 121°51′15″ E.); 409 meters; bottom temperature 11.78° C.; green mud; November 12, 1908. Two specimens.

Station 5430; in the vicinity of eastern Palawan; Fondeado Islands (W.) bearing N. 57° W., 10.5 miles distant (lat. 9°49′40″ N., long. 119°03′20″ E.); 848 meters; bottom temperature 10.00° C.; globigerina ooze; April 6, 1909. One specimen.

Remarks.—The specimen from station 5430 is a large and splendid example, 30 mm. in horizontal diameter and, together with the type specimen of *C. annulata*, among the finest specimens of *Caenopedina* known up to the present. The other specimens range from 23 to 26 mm. in horizontal diameter but are not so finely preserved.

Order CAMARODONTA

Family TEMNOPLEURIDAE

Genus PRIONECHINUS A. Agassiz

PRIONECHINUS FORBESIANUS (A. Agassiz)

Cottaldia forbesiana A. AGASSIZ, *Challenger* Reports, Zoology, vol. 3, pt. 9, p. 112, pl. 6a, figs. 15–17, 1881.

Arbacina forbesiana MORTENSEN, *Ingolf* Echinoidea, pt. 1, p. 83, pl. 7, figs. 22, 26, 32; pl. 8, fig. 33, 1903.

Prionechinus forbesianus DE MEIJERE, *Siboga* Echinoidea, p. 71, pl. 4, figs. 33, 34; pl. 16, figs. 250–255, 1904.—H. L. CLARK, Hawaiian and other Pacific Echini, Pedinidae, etc., p. 304, 1912; Catalogue of the recent sea-urchins in the British Museum, p. 79, 1925.

Localities.—Station 5112; China Sea, off southern Luzon; Sombrero Island bearing S. 18° E., 6.75 miles distant (lat. 13°48′22″ N., long. 120°47′25″ E.); 324 meters; bottom temperature 11.33° C.; dark green mud; January 17, 1908. One very young specimen—identification uncertain.

Station 5123; east coast of Mindoro; Malabrigo Light bearing N. 44° W., 32.5 miles distant (lat. 13°12′45″ N., long. 121°38′45″ E.); 517 meters; green mud; February 2, 1908. One fine adult specimen.

Station 5411; between Cebu and Bohol; Lauis Point Light bearing N. 35° E., 4.7 miles distant (lat. 10°10′30″ N., long. 123°51′15″ E.); 265 meters; bottom temperature 12.89° C.; green mud; March 23, 1909. One young specimen.

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Station 5607; Gulf of Tomini, Celebes; Binang Unang Island (E.) bearing S. 36° E., 5 miles distant (lat. 0°04′00″ S., long. 121°36′00″ E.); 1,391 meters; fine sand; November 18, 1909. Two adult specimens, one of them abnormal.

Station 5619; Molucca passage; Mareh Island (S.) bearing S. 78° E., 7 miles distant (lat. 0°35′00″ N., long. 127°14′40″ E.); 795 meters; fine gray sand and mud; November 27, 1909. One fine adult and one young specimen.

Station 5664; Macassar Strait; Kapoposang Light bearing N. 66° E., 3.8 miles distant (lat. 4°43′22″ S., long. 118°53′18″ E.); 731 meters; bottom temperature 6.28° C.; hard bottom; December 28, 1909. Twelve young specimens.

Remarks.—One of the specimens from station 5607 was remarkable in having the genital pores, situated in the middle of the genital plates, very small. On opening it, I found no traces of the genital organs, which ordinarily are quite easy to find, even in much smaller specimens. There can be no doubt that this specimen is abnormal—castrated for some reason. No parasites were found on or within it.

There is a pronounced sexual difference, the genital pores of the female being situated in the middle, or nearer the inner edge, the very small pores of the male at the very tip of the genital plates. Such sexual difference is found also in the other species of *Prionechinus* and must be regarded as an important character of the genus *Prionechinus.*

PRIONECHINUS SAGITTIGER A. Agassiz

Prionechinus sagittiger A. AGASSIZ, *Challenger* Reports, Zoology, vol. 3, pt. 9, p. 109, pl. 6a, figs. 11–14, 1881.—MORTENSEN, *Ingolf* Echinoidea, pt. 1, p. 82, pl. 7, figs. 21, 25, 29, 1903.—DE MEIJERE, *Siboga* Echinoidea, p. 70, pl. 16, figs. 245–249, 1904.—DÖDERLEIN, Wiss. Ergebn. Tiefsee-Exped., vol. 5, Lief. 2, p. 196, pl. 25, fig. 1; pl. 35, fig. 6; pl. 46, fig. 5, 1906.—H. L. CLARK, Hawaiian and other Pacific Echini, Pedinidae, etc., p. 304, 1912; Catalogue of the recent sea-urchins in the British Museum, 1925, p. 79.

Locality.—Station 5661; Flores Sea; Cape Lassa bearing N. 21° E., 12.5 miles distant (lat. 5°49′40″ S., long. 120°24′30″ E.); 329 meters; hard bottom; December 20, 1909. One young specimen.

Genus ORECHINUS Döderlein

ORECHINUS MONOLINI (A. Agassiz)

Trigonocidaris monolini A. AGASSIZ, *Challenger* Reports, Zoology, vol. 3, pt. 9, Echinoidea, p. 111, pl. 6a, figs. 8–10, 1881.

Genocidaris monolini DE MEIJERE, *Siboga* Echinoidea, p. 74, pl. 4, figs. 35–37; pl. 16, figs. 356–263, 1904.

Orechinus monolini DÖDERLEIN, Wiss. Ergebn. Tiefsee-Exped., vol. 5, Lief. 2, p. 196, pl. 25, fig. 1; pl. 35, fig. 6; pl. 46, fig. 5, 1906.—H. L. CLARK, Hawaiian and other Pacific Echini, Pedinidae, etc., p. 300, pl. 93, figs. 27–31, 1912.

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Localities.—Station 5601; Gulf of Tomini, Celebes; Limbe Island (NE.) bearing N., 20.7 miles distant (lat. 1°13′10″ N., long. 125°17′05″ E.); 1,398 meters; sand, globigerinae, and pteropods; November 13, 1909. Two specimens.

Station 5614; Molucca passage; Tifori Island (C.) bearing N. 19° E., 30.5 miles distant (lat. 0°31′00″ N., long. 125°58′45″ E.); 2,010 meters; gray mud, sand, and globigerinae; November 22, 1909. One young specimen.

Station 5637; near Bouro Island; Amblau Island (N.) bearing N. 80° E., 21 miles distant (lat. 3°53′20″ S., long. 126°48′00″ E.); 1,280 meters; gray mud; December 10, 1909. One specimen.

Remarks.—These are quite typical specimens, though varying to some degree in regard to the sculpture of the test and apical system.

Genus TEMNOPLEURUS A. Agassiz

TEMNOPLEURUS REEVESII (Gray)

Temnopleurus reevesii MORTENSEN, The Danish Expedition to Siam 1899–1900, II. Echinoidea [Danske Selsk. Skr., ser. 7, vol. 1, No. 1], p. 62, pl. 6, figs. 3, 10, 12; pl. 7, fig. 37, 1904.—H. L. CLARK, Hawaiian and other Pacific Echini, Pedinidae, etc., p. 313, 1912.—H. L. CLARK, Catalogue of the recent sea-urchins in the British Museum, p. 81, 1925.

Localities.—Station 5381; Ragay Gulf, Luzon; Arena Point, Luzon, bearing S. 68° W., 2.8 miles distant (lat. 13°14′15″ N., long. 122°44′45″ E.); 161 meters; coral sand; March 6, 1909. Four fine specimens.

Station 5382; Ragay Gulf, Luzon; Arena Point, Luzon, bearing S. 55° W., 3.8 miles distant (lat. 13°15′20″ N., long. 122° 45′30″ E.); 234 meters; mud; March 6, 1909. One young specimen.

Station 5475; east coast of Luzon; San Bernardino Light bearing S. 27° W., 11 miles distant (lat. 12° 55′25″ N., long. 124° 22′12″ E.); 356 meters; bottom temperature 15.17° C.; shells; June 24, 1909. Four specimens.

Station 5476; east coast of Luzon; San Bernardino Light bearing S. 37° W., 13.5 miles distant (lat. 12°56′24″ N., long. 124°25′24″ E.); 493 meters; bottom temperature 9.06° C.; fine sand; June 24, 1909. Three specimens.

Station 5547; near Jolo (Sulu); Noble Point, Tulayan Island (E.) bearing S. 38° E., 9.5 miles distant (lat. 6°09′20″ N., long. 121°13′40″ E.); 283 meters; bottom temperature 13.50° C.; fine sand; September 15, 1909. Two specimens.

TEMNOPLEURUS DECIPIENS (de Meijere)

Genocidaris decipiens DE MEIJERE, *Siboga* Echinoidea, p. 76, pl. 16, figs. 264–256, 1904.

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Localities.—Station 5159; Tawi Tawi group, Jolo (Sulu) Archipelago; Tinakta Island (N.) bearing N. 82° W., 1.4 miles distant (lat. 5°11′50″ N., long. 119°54′00″ E.); 18 meters; coral sand; February 21, 1908. One specimen.

Station 5164; Tawi Tawi group, Jolo Archipelago; Observation Island bearing S. 82° W., 8 miles distant (lat. 5°01′40″ N., long. 119°52′20″ E.); 33 meters; green mud; February 24, 1908. Four specimens.

Remarks.—Although these specimens are only dead tests, without the apical systems, the identification as *T. decipiens* is beyond doubt, the very characteristic sculpture of the test being quite sufficient for the certain recognition of this species.

That this species has nothing to do with *Genocidaris*, but is a near relation of *Temnopleurus reevesii* (Gray), will be set forth in vol. 3, pt. 2, of my Monograph of the Echinoidea.

Genus DESMECHINUS H. L. Clark

DESMECHINUS VERSICOLOR (Mortensen)

Gymnechinus versicolor Mortensen, The Danish Expedition to Siam 1899–1900, II. Echinoidea [Danske Selsk. Skr., ser. 7, vol. 1, No. 1], p. 116, pl. 7, figs. 24, 26, 30, 1904.—H. L. Clark, Catalogue of the recent sea-urchins in the British Museum, p. 129, 1925.

Locality.—Station 5355; North Balabac Strait; Balabac Light bearing S. 61° W., 16.6 miles distant (lat. 8°08′10″ N., long. 117°19′15″ E.); 80 meters; coral and sand; January 5, 1909. One specimen.

Remarks.—This specimen, of 20 mm. horizontal diameter and thus evidently adult, is rather unusually dark, being olive along the median spaces of both ambulacra and interambulacra on the aboral side. The spines are greenish but with the usual red bands.

This species is no *Gymnechinus*, but a temnopleurid of the genus *Desmechinus*, as will be explained in vol. 3, pt. 2, of my Monograph of the Echinoidea.

DESMECHINUS RUFUS (Bell)

Salmacis rufa Bell, Proc. Zool. Soc. London, 1894, 411, pl. 26, figs. 2, 3.

Psammechinus rufus Mortensen, The Danish Expedition to Siam 1899–1900, II. Echinoidea [Danske Selsk. Skr., ser. 7, vol. 1, No. 1], p. 122, pl. 5, fig. 16; pl. 7, figs. 34, 43, 1904.

Lytechinus rufus H. L. Clark, Hawaiian and other Pacific Echini, Pedinidae, etc., p. 246, 1912.

Locality.—Station 5179; in the vicinity of Romblon; Romblon Light bearing S. 56° E., 4.5 miles distant (lat. 12°38′15″ N., long. 122°12′30″ E.); 68 meters; bottom temperature 24.28° C.; hard sand; March 25, 1908. One old broken test.

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Remarks.—In spite of being in poor condition, with the apical system lost, this test proves itself, by its characteristic red mottled color as well as by its test structure, definitely to belong to the present species, which, like the species *versicolor*, belongs to the genus *Desmechinus*, as will be set forth in vol. 3, pt. 2, of my Monograph of the Echinoidea.

Genus SALMACIS L. Agassiz

SALMACIS BICOLOR L. Agassiz

Salmacis bicolor, var. *rarispina* Mortensen, The Danish Expedition to Siam 1899–1900, II. Echinoidea [Danske Selsk. Skr., ser. 7, vol. 1, No. 1], p. 65, pl. 6, figs. 2, 4, 23, 26, 39, 40; pl. 7, fig. 1, 1904.

Salmacis bicolor H. L. Clark, Catalogue of the recent sea-urchins in the British Museum, p. 84, 1925.

Localities.—Station 5137; in the vicinity of Jolo (Sulu); Jolo Light bearing S. 61° E., 1.3 miles distant (lat. 6°04′25″ N., long. 120°58′30″ E.); 36 meters; sand and shells; February 14, 1908. One specimen.

Station 5174; in the vicinity of Jolo; Jolo Light bearing E. 2.6 miles distant (lat. 6°03′45″ N., long. 120°57′00″ E.); 36 meters; coarse sand; March 5, 1908. One specimen.

Station 5149; in the vicinity of Siasi; Sirun Island (W.) bearing N. 39° E., 2.4 miles distant (lat. 5°33′00″ N., long. 120°42′10″ E.); 18 meters; coral and shells; February 18, 1908. One large and one small specimen.

Station 5151; Tawi Tawi group, Jolo Archipelago; Sirun Island (C.) bearing N. 58° E., 19.3 miles distant (lat. 5°24′40″ N., long. 120°27′15″ E.); 44 meters; coral sand and shells; February 18, 1908. One large broken specimen.

Station 5442; west coast of Luzon; San Fernando Point Light bearing N. 39° E., 8.4 miles distant (lat. 16°30′36″ N., long. 120°11′06″ E.); 82 meters; coral sand; May 10, 1909. Three specimens, two large and one small.

Station 5482; in the vicinity of Surigao Strait; Cabugan Grande Island (N.) bearing N. 87° W., 4.5 miles distant (lat. 10°27′30″ N., long. 125°18′00″ E.); 122 meters; broken shells, sand, and green mud; July 30, 1909. Three specimens.

Station 5555; in the vicinity of Jolo; Cabalian Point, Jolo, bearing N. 50° W., 3.3 miles distant (lat. 5°51′15″ N., long 120°58′35″ E.); 62 meters; coarse sand; September 18, 1909. One small specimen.

Station 5557; in the vicinity of Jolo; Cabalian Point, Jolo, bearing N. 70° W., 5.2 miles distant (lat. 5°51′30″ N., long. 121°01′00″ E.); 24 meters; sand and coral; September 18, 1909. One small fine specimen.

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Remarks.—The small specimens are interesting in showing, in the horizontal interambulacral sutures, a distinct depression on each side of the primary tubercle; also the dark color of the sutures makes them very conspicuous on the whitish ground color of the test. They produce a marked *Temnopleurus*-like aspect. It should be pointed out that I have found the above-mentioned depressions also in other young specimens of this species.

The specimen from station 5151 has the whole apical system deeply sunken, as if pressed in. It does not seem to be due to the effect of the presence of some parasitic organism.

Parasite.—A broken specimen of medium size from station 5482 is infested by three parasitic snails attached to the aboral side halfway to the apical system. They have produced the effect that the test has become abnormally constricted, the uppermost part forming like a top on the lower part. At the level of the parasites are found a number of small brownish bodies loosely attached to the test. They seem to be egg masses of the snails, but the preservation is not good enough for ascertaining definitely their nature. The brown color appears to be due to the alcohol having been colored by crinoids.

SALMACIS SPHAEROIDES (Linnaeus)

Salmacis sphaeroides MORTENSEN, The Danish Expedition to Siam 1899–1900, II. Echinoidea [Danske Selsk. Skr., ser 7, vol. 1, No. 1], p. 70, pl. 5, fig. 23; pl. 6, figs. 1, 11, 41, 1904.—H. L. CLARK, Catalogue of the recent sea-urchins in the British Museum, p. 87, 1925.

Localities.—Station 5165; Tawi Tawi group, Sulu (Jolo) Archipelago; Observation Island bearing N. 70° W., 6.4 miles distant (lat. 4°58′20″ N., long. 119°50′30″ E.); 16 meters; coral; February 24, 1909. One specimen.

Catbalogan, Sámar; littoral; April 15, 1908. One specimen.

Remarks.—The specimen from station 5165 is unusual in that the bases of most of the spines are not greenish, but reddish or purple, recalling *S. bicolor*, but in its other characters it is a typical *sphaeroides*, so there can be no doubt that it is really *sphaeroides*. The test is nearly white, with merely an indication of a dark band of isolated spots at the ambitus.

SALMACIS VIRGULATA L. Agassiz

Salmacis virgulata typica DÖDERLEIN, Jenaische Denkschr., vol. 8, p. 712, pl. 62, fig. 2, 1902.—MORTENSEN, the Danish Expedition to Siam 1899–1900, II. Echinoidea [Danske Selsk. Skr., ser. 7, vol. 1, No. 1], p. 68, pl. 6. figs. 7, 18, 46, 47; pl. 7, fig. 40. 1904.

Locality.—Station 5157; Tawi Tawi group, Jolo (Sulu) Archipelago; Tinakta Island (N.) bearing S. 80° W., 3.3 miles distant (lat. 5°12′30″ N., long. 119°55′50″ E.); 33 meters; fine sand and shells; February 21, 1908. One fine specimen of the form *typica*.

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SALMACIS DUSSUMIERI L. Agassiz

Salmacis dussumieri Döderlein, Jenaische Denkschr., vol. 8, p. 715, pl. 63, figs. 5–5c, 1902.—Mortensen, The Danish Expedition to Siam 1899–1900, II. Echinoidea [Danske Selsk. Skr., ser. 7, vol. 1, No. 1], p. 72, pl. 7, fig. 15, 1904.

Localities.—Station 5433; in the vicinity of eastern Palawan; Corandagos Island (NW.) bearing N. 35° E., 6.5 miles distant (lat. 10° 37′30″ N., long. 120°11′05″ E.); 99 meters; green mud and coral sand; April 8, 1909. One young specimen.

Station 5181; off eastern Panay; Antonia Island (S.) bearing S. 63° W., 6.6 miles distant (lat. 11°36′40″ N., long 123°26′35″ E.); 47 meters; mud and fine sand; March 27, 1908. Two young specimens.

Genus TEMNOTREMA A. Agassiz

TEMNOTREMA SIAMENSE (Mortensen)

Pleurechinus siamensis Mortensen, The Danish Expedition to Siam 1899–1900, II. Echinoidea [Danske Selsk. Skr., ser. 7, vol. 1, No. 1], p. 79, pl. 1, figs. 2, 7, 11, 20; pl. 2, figs. 2, 9, 14, 15, 22, etc., 1904.

Temnotrema siamensis H. L. Clark, Hawaiian and other Pacific Echini, Pedinidae, etc., p. 318, 1912.

Temnotrema siamense H. L. Clark, Catalogue of the recent sea-urchins in the British Museum, p. 92, 1925.

Localities.—Station 5143; in the vicinity of Jolo (Sulu); Jolo Light bearing S. 50° W., 3.4 miles distant (lat. 6°05′50″ N., long. 121°02′15″ E.); 35 meters; coral sand; February 15, 1908. Two specimens.

Station 5159; Tawi Tawi group, Jolo Archipelago; Tinakta Island (N.) bearing N. 82° W., 1.4 miles distant (lat. 5°11′50″ N., long. 119°54′00″ E.); 18 meters; coral sand; February 21, 1908. Three specimens.

Remarks.—The two specimens from station 5143 and two of those from station 5159 are naked tests, without the apical system. The identification of these specimens is not fully certain. The third specimen, from station 5159, is a fairly well preserved adult 10 mm. in diameter. The color is a light brownish, mottled with greenish olive. The spines are very light greenish, with a narrow brownish band distally. The very few spines that are not broken have a slight terminal swelling. There can be no doubt that this specimen is a typical *T. siamense*.

TEMNOTREMA PULCHELLUM (Mortensen)

Pleurechinus siamensis, var. *pulchellus* Mortensen, The Danish Expedition to Siam 1899–1900, II. Echinoidea [Danske Selsk. Skr., ser. 7, vol. 1, No. 1], p. 82, 1904.

Locality.—Station 5218; between Burias and Luzon; Anima Sola Island (E.) bearing N. 10° W., 2 miles distant (lat. 13°11′15″ N., long. 123°02′45″ E.); 36 meters; coarse sand; April 22, 1908. One specimen.

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Remarks.—As will be explained in my Monograph of the Echinoidea, vol. 3, pt. 2, this form is not related to *T. siamense*, but to *T. maculatum*, of which it may perhaps be only a color variety, like *T. pallescens* H. L. Clark. But in any case it is so characteristic in its uniform red or purplish color that it must be kept separate, be it as a distinct species, as I think preferable, or only as a variety of *T. maculatum*.

TEMNOTREMA RETICULATUM (Mortensen)

Pleurechinus reticulatus MORTENSEN, *in* de Meijere, *Siboga* Echinoidea, p. 202, 1904.

Locality.—Station 5400; north of Cebu; Tanguingui Island Light bearing N. 77° W., 22.5 miles distant (lat. 11°24′24″ N., long. 124°05′30″ E.); 46 meters; sand and shells; March 18, 1909. One specimen.

Remarks.—The specimen taken by the *Albatross* off Cebu is a well-preserved and perfectly typical specimen. In spite of its small size, 4.5 mm. in diameter, it is adult. The species apparently does not reach a larger size than about 5 mm. in diameter.

This species has never been properly described. In his *Siboga* Echinoidea de Meijere mentioned the species *Pleurechinus reticulatus*, characterized by its thorny spines and its large suranal plate, distinguished by me among the specimens he had identified as *Pleurechinus bothryoides*. He refers to the description that was to be given in my work on the Siam Echinoidea. In the meantime, however, I had come to the conclusion that the form I had distinguished as *Pleurechinus reticulatus* should rather be united with *P. scillae* (Mazzetti), and so I withdrew *reticulatus* as a synonym only of *P. scillae*. The study of the rich material of these forms that I collected in the Malay Archipelago in 1922 and 1929, and in the Gulf of Suez in 1936, has, however, convinced me that the form originally distinguished as *P. reticulatus* is so characteristic and constant that it must be regarded as a distinct species, the name of which is thus to be *Temnotrema reticulatum* (Mortensen). A full description of this species will be given in vol. 3, pt. 2, of my Monograph of the Echinoidea.

Genus MICROCYPHUS L. Agassiz and Desor

MICROCYPHUS EXCENTRICUS, new species

Characters.—The single specimen is a small one, 17 mm. in horizontal diameter and 11 mm. high. It is distinctly pentagonal, slightly sunken in the interambulacra. The naked areas in the ambulacra as well as in the interambulacra are broad and sharply delimited against the tuberculated part of the plates. The primary

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ambulacral tubercles are distinct and form a regular series throughout. The interambulacral primary tubercles do not form distinct vertical series, and there are no horizontal series on any of the plates. The pore pairs are not arranged biserially or in distinct arcs of three. The apical system is seen to have been distinctly elongate. The peristome is large, 47 percent of the diameter of the test. The gill slits are small but fairly sharp. The color of the naked areas is reddish, a little darker along the sutures; a narrow dark line separates the naked areas sharply from the whitish tuberculated part of the plates.

Locality.—Pangasinan Island, near Jolo (Sulu); reef in the southern part; scattered coral; February 13, 1908. One naked test without apical system, probably found on the beach.

Remarks.—This species recalls to some degree a young *Coelopleurus*. It is very regrettable that only a single naked test of this species was found. The characters of the test alone, however, distinguish it markedly from all other known recent species of *Microcyphus*. On the other hand, it shows a considerable likeness to the fossil *Microcyphus javanus* Jeannet from the Miocene of Java, and it is very likely that it is the direct descendant of this fossil species. In this latter the apical system is not elongate as it is in the recent form, and if this be a constant character, which cannot be stated definitely from the single known specimen, this will mean that the recent form has undergone a remarkable specialization in this regard.

MICROCYPHUS species

Note.—The collection includes two naked worn tests lacking the apical system, without locality, of some species of *Microcyphus*. I do not think it possible to identify them with certainty as to species.

Genus MESPILIA L. Agassiz and Desor

MESPILIA GLOBULUS (Linnaeus)

Mespilia globulus A. AGASSIZ, Revision of the Echini, pt. 3 [Mem. Mus. Comp. Zool., vol. 3], p. 477, pl. 8a, figs. 13, 14, 1873.—MORTENSEN, The Danish Expedition to Siam 1899–1900, II. Echinoidea [Danske Selsk. Skr., ser. 7, vol. 1, No. 1], p. 96, pl. 7, figs. 16, 22, 33, 47, 1904.—H. L. CLARK, Hawaiian and other Pacific Echini, Pedinidae, etc., p. 322, 1912; Catalogue of the recent sea-urchins in the British Museum, p. 93, 1925.

Localities.—Station 5159; Tawi Tawi group, Jolo (Sulu) Archipelago; Tinakta Island (N.) bearing N. 82° W., 1.4 miles distant (lat. 5°11′50″ N., long. 119°54′00″ E.); 18 meters; coral sand; February 21, 1908. Two specimens.

Cebu reef; April 4, 1908. One specimen.

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Station 5557; in the vicinity of Jolo; Cabalian Point bearing N. 70° W., 5.2 miles distant (lat. 5°51′30″ N., long. 121°01′00″ E.); 24 meters; sand and coral; September 17, 1909. One specimen.

Family TOXOPNEUSTIDAE

Genus TOXOPNEUSTES L. Agassiz

TOXOPNEUSTES PILEOLUS (Lamarck)

Toxopneustes pileolus MORTENSEN, *Ingolf* Echinoidea, pt. 1, p. 111, pl. 21, figs. 13, 21, 41, 1903; The Danish Expedition to Siam 1899–1900, II. Echinoidea [Danske Selsk. Skr., ser. 7, vol. 1, No. 1], p. 120, 1904.—H. L. CLARK, Catalogue of the recent sea-urchins in the British Museum, p. 123, 1925.

Localities.—Station 5138; in the vicinity of Jolo (Sulu); Jolo Light bearing S. 19° E., 2.5 miles distant (lat. 6°06′00″ N., long. 120°58′50″ E.); 35 meters; sand and coral; February 14, 1908. One specimen.

Station 5149; in the vicinity of Siasi; Sirun Island (W.) bearing N. 39° E., 2.4 miles distant (lat. 5°33′00″ N., long. 120°42′10″ E.); 18 meters; coral and shells; February 18, 1908. One broken specimen.

Station 5155; Tawi Tawi group, Jolo Archipelago; Bakun Point bearing N. 70° E., 1.7 miles distant (lat 5°13′40″ N., long. 119°57′20″ E.); 22 meters; coral sand; February 19, 1908. One young specimen.

Remarks.—The specimen from station 5138 is a large one, about 125 mm. in diameter, but badly broken. The spines of the aboral side are green, but those of the oral side are distinctly red at the base, as is typical of this species.

Genus TRIPNEUSTES L. Agassiz

TRIPNEUSTES GRATILLA (Linnaeus)

Tripneustes gratilla LOVÉN, Bihang Svenska Vet. Akad. Handl., vol. 13, pt. 4, No. 5, p. 77, 1887.—H. L. CLARK, The echinoderm fauna of Torres Strait, p. 148, pl. 17, fig. 6, 1921; Catalogue of the recent sea-urchins in the British Museum, p. 124, 1925.

Localities.—Station 5165; Tawi Tawi group, Jolo (Sulu) Archipelago; Observation Island bearing N. 70° W., 6.4 miles distant (lat. 4°58′20″ N., long. 119°50′30″ E.); 17 meters; coral; February 24, 1909. Three specimens.

Station 5149; in the vicinity of Siasi; Sirun Island (W.) bearing N. 39° E., 2.4 miles distant (lat. 5°33′00″ N., long. 120°42′10″ E.); 18 meters; coral and shells; February 18, 1908. Two specimens, one large and one young.

Joló; shore; March 6, 1908. One specimen.

Romblon; shore; March 26, 1908. Three specimens.

Tilig Bay, southern Luzon; June 15, 1908. One specimen.

Varadero Bay, Mindoro; July 23, 1908. Two specimens.

Port Matalvi, Luzon; November 23, 1909. One specimen.

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Pandanon Island; March 23, 1909. One specimen.

San Pascual, Burias Island; tide pool; March 8, 1909. One young specimen.

Atulayan Island; littoral; June 18, 1909. Ten specimens.

Tomahu Island; tide pool; December 12, 1909. One specimen.

Family ECHINOMETRIDAE

Genus PARASALENIA A. Agassiz

PARASALENIA GRATIOSA A. Agassiz

Parasalenia gratiosa A. Agassiz, Revision of the Echini, pt. 3 [Mem. Mus. Comp. Zool., vol. 3], p. 435, pl. 3d, figs. 1, 2; pl. 6, fig. 14, 1873.—Mortensen, The Danish Expedition to Siam 1899–1900, II. Echinoidea [Danske Selsk. Skr., ser. 7, vol. 1, No. 1], p. 121, pl. 5, fig. 36, 1904.—H. L. Clark, Hawaiian and other Pacific Echini, Pedinidae, etc., p. 369, 1912; Catalogue of the recent sea-urchins in the British Museum, p. 141, 1925.

Localities.—Station 5109; China Sea, off southern Luzon; Corregidor Light bearing N. 42° E., 25.8 miles distant (lat. 14°03′45″ N., long. 120°16′30″ E.); 18 meters; coral; January 15, 1908. One specimen.

Station 5159; Tawi Tawi group, Joló (Sulu) Archipelago; Tinakta Island (N.) bearing N. 82° W., 1.4 miles distant (lat. 5°11′50″ N., long. 119°54′00″ E.); 19 meters; coral sand; February 21, 1908. One specimen.

Apra Bay, Guam; November 19, 1907. Four specimens.

Tataan, Simulac Island; February 19, 1908. One specimen.

Remarks.—The specimen from station 5159, although an adult 24 mm. long, has the genital plates almost naked; only a small tubercle is found at the inner edge of genitals 2 and 3. Also in the largest specimen from Guam, 17 mm. long, the genital plates are entirely naked. Accordingly the presence or absence of tubercles on the genital plates gives no reliable distinction between *P. gratiosa* and *P. pöhlii*, as H. L. Clark thinks, using this character in his key to the species of *Parasalenia*.

Parasite.—On the specimen from station 5159 was found a specimen of the interesting epizoic ophiuran *Ophiosphaera*, carrying, as usual, the pygmy male individual across its mouth. As usual, the female had its back toward the test of the sea-urchin.[7]

PARASALENIA PÖHLII Pfeffer

Parasalenia pöhlii H. L. Clark, Hawaiian and other Pacific Echini, Pedinidae, etc., p. 369, pl. 95, figs. 1–5, 1912.

Parasalenia poehli H. L. Clark, Catalogue of the recent sea-urchins in the British Museum, p. 142, 1925.

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[7] Cf. Mortensen, Vid. Medd. Dansk Naturh. Foren., vol. 93, p. 183, 1933.

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Locality.—Station 5109; China Sea, off southern Luzon; Corregidor Light bearing N. 42° E., 25.8 miles distant (lat. 14°03′45″ N., long 120°16′30″ E.); 18 meters; coral; January 15, 1908. One young specimen.

Genus SELENECHINUS de Meijere

SELENECHINUS ARMATUS de Meijere

Selenechinus armatus DE MEIJERE, *Siboga* Echinoidea, p. 99, pl. 5, figs. 38, 39; pl. 17, figs. 291–299, 1904.

No locality.—Two specimens.

Remarks.—The collection contains two specimens, the larger of them 100 mm. in diameter, agreeing completely with the description and figures given by de Meijere. Unfortunately they are without any label, which is the more regrettable since the type and only specimen hitherto recorded likewise had no label, so that de Meijere could state only that most probably it came from the Jolo Sea. This may very probably be the case also with the *Albatross* specimens, but there is no certainty, and likewise the depth at which it was taken remains unknown.

Genus ECHINOSTREPHUS A. Agassiz

ECHINOSTREPHUS FORMOSUS, new species

Characters.—The test is very low, only 5 mm. in height, with a horizontal diameter of 13 mm. The sides are regularly rounded, not subvertical as is usual in *Echinostrephus*, and the greatest diameter is at the ambitus, not on the aboral side. The shape of the test is thus very different from the usual in *Echinostrephus*. There are four pore pairs on the ambulacral plates of the aboral side. Miliary tubercles are few, none separating the primary interambulacral tubercles as is the case in *Echinostrephus molaris*. The genital plates carry each two tubercles at their inner edge. Periproctal plates are few, rather large. There is no anal proboscis. The pedicellariae are not peculiar. The spines are as usual, the aboral ones the longest. They are purple with the tip white. The color of the test is a light bluish purplish, the apical system reddish purplish.

Locality.—Station 5558; in the vicinity of Jolo; Cabalian Point bearing S. 1.1 miles distant (lat. 5°51′33″ N., long. 121°00′58″ E.); 27 meters; coral; September 17, 1909. One specimen, the type.

Remarks.—This very handsome species differs particularly by the unusual shape of the test very conspicuously from the other species of the genus *Echinostrephus*. Probably it is only a young specimen, but the genital pores have been formed, though still quite small.

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A more detailed description of this species, accompanied by the necessary illustrations, will be given in vol. 3, pt. 2, of my Monograph of the Echinoidea.

Genus ECHINOMETRA Gray

ECHINOMETRA MATHAEI (de Blainville)

Echinometra mathaei MORTENSEN, *Ingolf* Echinoidea, pt. 1, p. 128, 1903.—H. L. CLARK, Hawaiian and other Pacific Echini, Pedinidae, etc., p. 372, 1912; Catalogue of the recent sea-urchins in the British Museum, p. 143, 1925.

Localities.—Station 5108; China Sea, off southern Luzon; Corregidor Light bearing N. 39° E., 22.5 miles distant (lat. 14°05′05″ N., long. 120°19′45″ E.); 23 meters; coral; January 15, 1908. One young specimen.

Station 5140; in the vicinity of Jolo (Sulu); Jolo Light bearing S. 33° W., 6.1 miles distant (lat. 6°08′45″ N., long. 121°03′00″ E.); 139 meters; fine coral sand; February 14, 1908. Two specimens.

Port Binanga, Subig Bay, Luzon; January 9, 1908. Six specimens.

Nazug Bay, Luzon; January 16, 1908. One young specimen.

Marongas Island; February 10, 1908. One young specimen.

Tataan, Simulac Island; February 19, 1908. One specimen.

Jolo; shore; March 6, 1908. One specimen.

Endeavor Strait, Palawan; December 22–24, 1908. Two specimens.

Sirinao Island, Palawan; December 31, 1908. One specimen.

Verde del Sur Island, Palawan; April 6, 1909. Three young specimens.

Batan Island; June 5, 1909. Two specimens.

Macalubo Island; June 14, 1909. One specimen.

Remarks.—The finding of a specimen of this eminently littoral sea-urchin at a depth of 139 meters (station 5140) is so extraordinary that I cannot help suggesting that some mistake has occurred in the labeling. It has not otherwise been recorded from a greater depth than 34 meters, at which depth it was dredged by the *Siboga*.

ECHINOMETRA PICTA A. Agassiz and H. L. Clark

Echinometra picta H. L. CLARK, Hawaiian and other Pacific Echini, Pedinidae, etc., p. 373, pl. 95, figs. 6–12; pl. 114, figs. 5, 6, 1912.

Locality.—Apra Bay, Guam; November 19, 1907. Four specimens.

Remarks.—Without entering here on the question of the specific validity of *Echinometra picta*, or its possible identity with *E. mathaei*, I can only say that these specimens seem to me to fit well with the description of *E. picta* and to differ rather conspicuously in general appearance from the Philippine specimens of *E. mathaei*, so that it seems quite natural to keep them under a separate name.

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ECHINOMETRA OBLONGA (de Blainville)

Echinometra oblonga H. L. Clark, Hawaiian and other Pacific Echini, Pedinidae, etc., p. 373, pl. 114, figs. 1, 2, 1912; Catalogue of the recent sea-urchins in the British Museum, p. 144, 1925.

Localities.—Port Binanga, Subig Bay, Luzon; January 9, 1908. Five specimens.

Nasug Bay, Luzon; reef; January 16, 1908. Three specimens.

Balayan Bay; January 18, 1908. One specimen.

Papatag Island, Tawi Tawi; February 23, 1908. One specimen.

Port Palapag; June 3, 1909. One specimen.

Batan Island; July 22, 1909. Six specimens.

Genus HETEROCENTROTUS Brandt

HETEROCENTROTUS MAMMILLATUS (Linnaeus)

Heterocentrotus mammillatus H. L. Clark, Hawaiian and other Pacific Echini, Pedinidae, etc., p. 378, pls. 115–117, 1912; Catalogue of the recent sea-urchins in the British Museum, p. 147, 1925.

Localities.—Tataan, Simulac Island; February 19, 1908. One specimen.

Mahinog, Camiguin Island; August 3, 1909. Three specimens.

Tidore Island; November 25, 1909. One specimen.

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Bulletin 100

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CONTRIBUTIONS TO THE BIOLOGY OF THE PHILIPPINE ARCHIPELAGO AND ADJACENT REGIONS

DESCRIPTIONS AND FIGURES OF NEW FISHES OBTAINED IN PHILIPPINE SEAS AND ADJACENT WATERS BY THE UNITED STATES BUREAU OF FISHERIES STEAMER "ALBATROSS"

BY

HENRY W. FOWLER

UNITED STATES

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DESCRIPTIONS AND FIGURES OF NEW FISHES OBTAINED IN PHILIPPINE SEAS AND ADJACENT WATERS BY THE UNITED STATES BUREAU OF FISHERIES STEAMER "ALBATROSS"

By Henry W. Fowler

The fishes described in this paper represent the groups Isospondyli, Iniomi, Lophobranchii, Percomorphi, Cataphracti, Chromides, Jugulares, and Plectognathi. They were discovered after detailed reports on the *Albatross* fishes in these groups were prepared.[1] The explanations of the computations, sequence of characters, and other data, as well as diagnoses of the higher groupings (as orders, families, subfamilies, and genera) pertaining to the new species studied, are given in the full reports or in three supplemental papers on the collection that have been issued.[2]

Family ALEPOCEPHALIDAE

Genus XENODERMICHTHYS Günther

AUCHENALEPOCEPS, new subgenus

Type.—*Xenodermichthys funebris*, new species.

Occiput forms depression, very distinct in profile, with the advanced predorsal region bulging. This region of predorsal with a median groove extending back as far as gill opening.

Differs from the subgenus *Xenodermichthys* in the above characters, as well as in proportions, facies, and fins.

(*αὐχήν*, nape+*Alepocephalus*.)

[1] Six volumes describing the fishes contained in the *Albatross* Philippine collections have now appeared in U. S. National Museum Bulletin 100—vol. 7 (1928), vol. 8 (1929), vol. 10 (1930), vol. 11 (1931), vol. 12 (1933), and vol. 13 (1941).

[2] Descriptions of new fishes obtained 1907 to 1910, chiefly in the Philippine Islands and adjacent seas. Proc. Acad. Nat. Sci. Philadelphia, vol. 85, pp. 233–367, figs. 1–117, 1934.

Descriptions of new fishes obtained by the United States Bureau of Fisheries steamer *Albatross*, chiefly in Philippine seas and adjacent waters. Proc. U. S. Nat. Mus., vol. 85, pp. 31–135, figs. 6–61, 1938.

New fishes of the family Callionymidae, mostly Philippine, obtained by the United States Bureau of Fisheries steamer *Albatross*. Proc. U. S. Nat. Mus., vol. 90, pp. 1–31, figs. 1–16, 1941.

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XENODERMICHTHYS FUNEBRIS, new species

FIGURE 4

Depth $5\frac{1}{4}$; head $3\frac{5}{6}$, width $2\frac{1}{3}$. Snout $6\frac{1}{6}$ in head, convex, short, front end level with lower eye edge; eye $5\frac{1}{2}$, greatly exceeds snout, $1\frac{1}{3}$ in interorbital; orbit $4\frac{1}{10}$ in head; maxillary reaches below hind eye edge, length $2\frac{1}{3}$ in head, expansion $1\frac{3}{4}$ in eye; mouth moderate, little inclined from horizontal, upper jaw little protruded and with lower jaw included as closed; teeth minute, uniform, simple, along edges of jaws, those below much closer as jaws approximated rather closely; interorbital convex, moderately high, width $4\frac{1}{3}$ in head. Gill opening large, laterally cleft forward nearly midway in head length. Gill rakers 10+17, pointed flexible lamellae, $\frac{2}{5}$ longer than gill filaments or equal pupil.

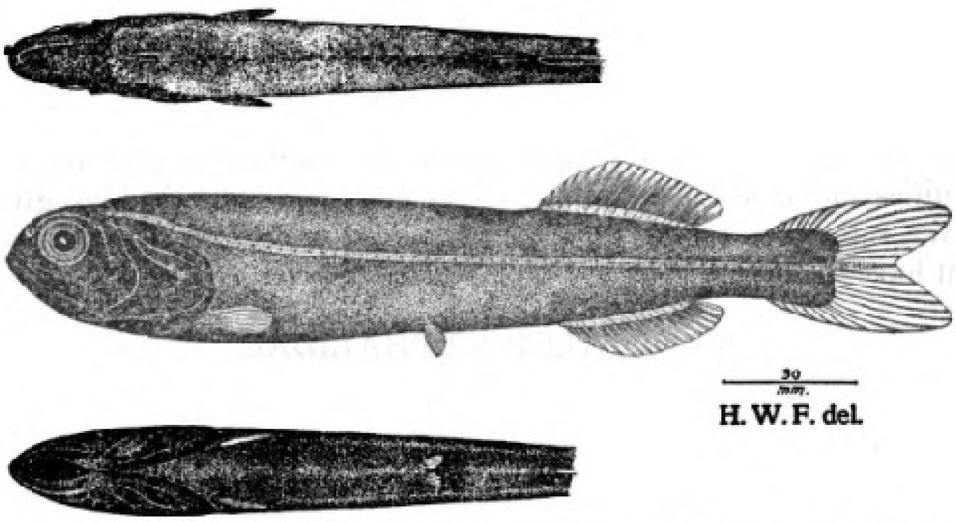


FIGURE 4.—*Xenodermichthys funebris*, new species: Type (U.S.N.M. No. 99534).

Body scaleless. Lateral line axial along side, 55 pores from preopercle to hind end of caudal squamation and 6 or more continued out on middle rays of caudal.

D. 20, I, well postmedian, sixth ray $3\frac{4}{5}$ in head; A. 19, origin little behind dorsal origin, seventh ray 5 in head; caudal $1\frac{1}{4}$, fin forked, with broad lobes; least depth of caudal peduncle $3\frac{1}{3}$; pectoral small, short, low, rays I, 8, fin $3\frac{2}{5}$ in head; ventral $6\frac{1}{10}$, rays I, 5.

Color in alcohol uniform velvety black, little paler around dorsal and anal bases narrowly. Fins all blackish, like body.

Type.—U.S.N.M. No. 99534. D. 5348. Point Tabonan, S. 90° E., 33.5 miles (lat. 10°57′45″ N., long 118°38′15″ E.), Palawan Passage. In 375 fathoms. December 27, 1908. No. 3534. Length 188 mm. to end of broken caudal.

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A species resembling *Xenodermichthys squamilaterus* Alcock [3] but differing from that species in proportions, smaller head, deeper body, smaller vertical fins, smaller eye, and shorter maxillary.

(*funebris*, funereal, with reference to its black color.)

Genus LEPTODERMA Vaillant

LEPTODERMA RETROPINNA, new species

FIGURE 5

Depth $10\frac{7}{8}$; head $4\frac{4}{7}$, width $2\frac{1}{10}$. Snout $3\frac{1}{2}$ in head, convex, front end forms little below middle of eye; eye $3\frac{1}{2}$, subequal with snout, greatly exceeds bony interorbital; orbit very large, diameter $2\frac{2}{7}$ in

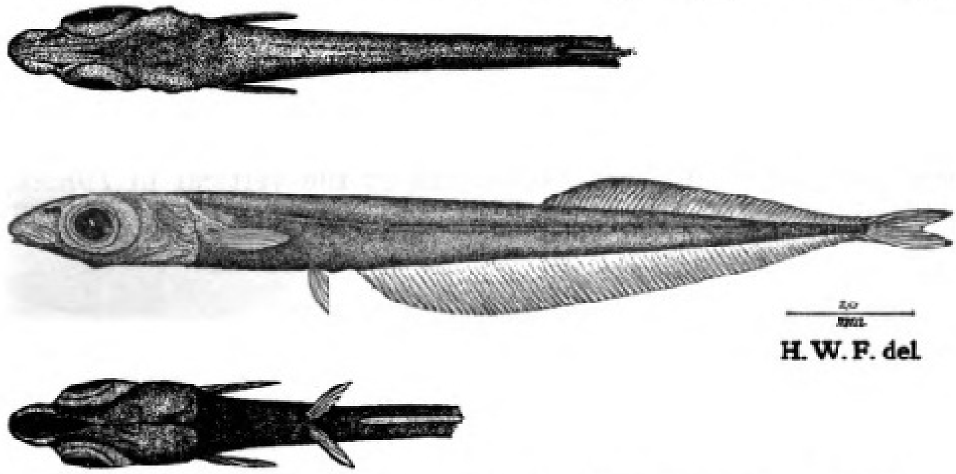


FIGURE 5.—*Leptoderma retropinna*, new species: Type (U.S.N.M. No. 99512).

head; maxillary reaches front edge of orbit, length 4 in head; mouth small, but little inclined from horizontal, upper jaw longer and lower included; bony interorbital width 2 in eye, level or little depressed. Gill opening small, inferior.

Body scaleless. Lateral line little distinct, axial along side of body.

D. 54, fin origin postmedian in fish, fourteenth ray $4\frac{1}{3}$ in head; A. 75, fin origin at first $\frac{2}{5}$ in combined head and body without caudal, fifteenth ray $3\frac{1}{10}$ in head, and like dorsal confluent with caudal; caudal $2\frac{1}{8}$, fin forked; caudal peduncle very narrowly constricted; pectoral $2\frac{2}{5}$, rays 10; ventral rays I, 5, fin $3\frac{1}{2}$ in head.

Color in alcohol largely blackish, with black line along base of dorsal and another along anal base. Fins blackish.

Greatly like *Leptoderma macrops* Vaillant [4] and *Leptoderma affinis*

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[3] Ann. Mag. Nat. Hist., ser. 7, vol. 2, p. 148, 1898 (type locality: Off the Andamans); Illustrations of the zoology of H. M. Indian Marine surveying steamer *Investigator*, pt. 1, Fishes, pl. 25, fig. 4, 1899 (type).

[4] Compt. Rend. Acad. Sci. Paris, vol. 103, p. 1239, 1886 (type locality: No locality given, *Talisman* dredgings).—FOWLER, Bull. Amer. Mus. Nat. Hist., vol. 70, pt. 1, p. 193, fig. 82, 1936 (compiled).

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Alcock,[5] but differs in the more posterior insertion of the dorsal, which is midway between the pectoral origin and the caudal base.

Type.—U.S.N.M. No. 99512. D. 5495. Diuata Point (N.), N. 76° E., 9.4 miles (lat. 9°06′30″ N., long. 125°00′20″ E.), between Leyte and Mindanao. In 976 fathoms. August 2, 1909. No. 4460. Length 147 mm.

(*retropinna*, backward fin.)

Family IPNOPIDAE

IPNOCEPS, new genus

Type.—*Ipnoceps pristibrachium*, new species.

Differs from *Ipnops* chiefly in the uppermost or simple pectoral ray with its upper edge dentated or irregularly serrated. The anal fin base is greatly longer than shown by Günther and by Goode and Bean for the Atlantic *Ipnops murrayi.* The longer pectoral also reaches nearer to level with the dorsal origin in the vertical in *Ipnoceps.* The luminous superocephalic organ is also broader in *Ipnoceps.* The fins, proportions, and scales all differ from those of *Ipnops.*

One species in the western Pacific.

(ʼιπνός, lantern + κεφἄλή, head.)

IPNOCEPS PRISTIBRACHIUM, new species

FIGURE 6

Depth 11⅛; head 4¼, width 1¾. Snout broadly arched as viewed from above; large luminous cephalic organ broad as long; maxillary reaches halfway in head, expansion 7 in head; mandible 1½; mouth but little inclined from horizontal, with mandible well protruded in front. Gill opening large, well extended forward to about first sixth in head.

Scales 47+1 in axial lateral series; 8 transversely below dorsal origin; 21 predorsal; 3 large scales between origins of ventrals; 4 scales transversely on side of caudal peduncle.

D. I, 9, I, first branched ray 1¼ in total head length; A. II, 13, I, third ray 2; caudal subequal with head, convex behind; pectoral rays I, 12, fin 1⅕ in head; ventral 1⅛, rays I, 7.

Color in alcohol uniform black. Luminous cephalic organ pearl-white. Pale or light streaks along each side of predorsal squamation down to pectoral base.

The distinctive characters are contained largely in the generic account above.

Type.—U.S.N.M. No. 99508. D. 5607. Binang Unang Island (E.) S. 36° E., 5 miles (lat. 00°04′00″ S., long. 121°36′00″ E.), Gulf of

[5] Catalogue of deep-sea fishes obtained by the *Investigator*, p. 180, pl. 32, fig. 3, 1899 (type).

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Tomini, Celebes, Dutch East Indies. In 761 fathoms. November 18, 1909. No. 1737. Length 158 mm. to end of broken caudal.

Paratypes.—U.S.N.M. No. 99509. D. 5606. Dodepo Island (W.) N. 3°W., 10.8 miles (lat. 0°16′28″ N., long. 121°33′30″ E.), Gulf of Tomini, Celebes, Dutch East Indies. In 834 fathoms. November 17, 1909. No. 4086. Length 145 mm. to end of broken caudal.

U.S.N.M. No. 99510. D. 5608. Binang Unang Island peak, S. 87° E., 19 miles (lat. 0°08′00″ S., long 121°90′00″ E.), Gulf of Tomini, Celebes, Dutch East Indies. In 1,089 fathoms. November 18, 1909. No. 3838. Length 128 mm. to end of broken caudal.

(πρίστις, saw + βρᾰχίων, arm.)

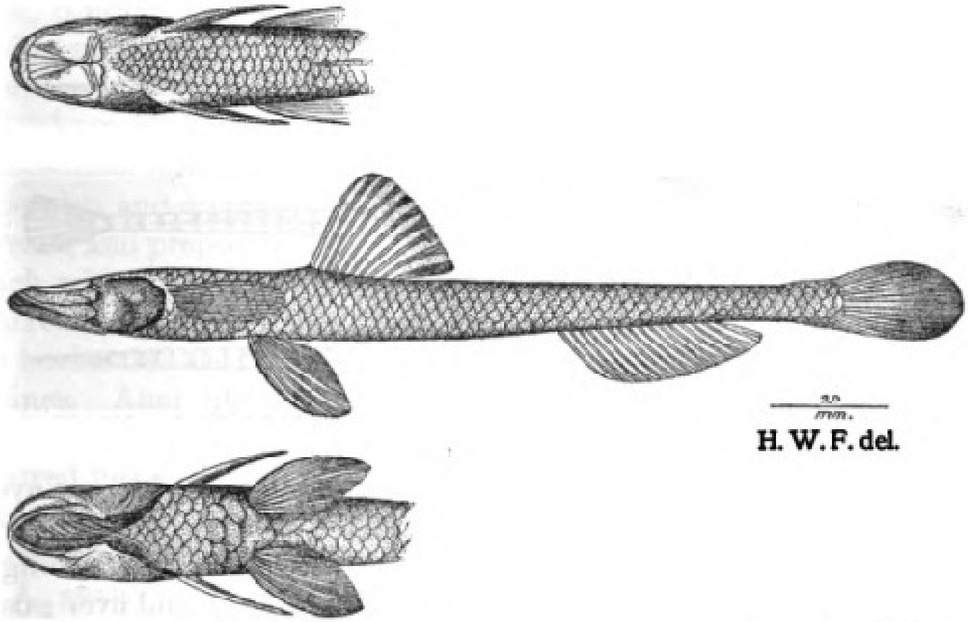


FIGURE 6.—*Ipnoceps pristibrachium*, new species: Type (U. S. N. M. No. 99508).

Family SYNGNATHIDAE

PARABELONICHTHYS, new genus

Type.—*Parabelonichthys kellersi*, new species.

Body compressed, with rather feeble cristae or keels, which smooth and on trunk; three auxiliaries along each interval longitudinally of fundamental cristae; superior cristae of head and trunk discontinuous; inferior cristae of trunk and tail discontinuous; median cristae of trunk and inferior cristae of tail continuous. Tail little longer than combined head and trunk. Vent little premedian. Dorsal begins little before middle between gill opening and vent, rays 57, on 15 rings of which 5 belong to tail. Anal present. Caudal well developed. Pectoral large, with broad base.

Related to *Belonichthys* Peters but differing chiefly in its auxiliary longitudinal trunk keels.

(παρά, near + *Belonichthys*.)

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PARABELONICHTHYS KELLERSI, new species

FIGURE 7

Depth $15\frac{2}{5}$, $7\frac{1}{5}$ to vent; head $3\frac{4}{7}$, $7\frac{1}{3}$ to caudal base, width $3\frac{1}{2}$ in head length. Snout $2\frac{1}{2}$ in head from snout tip; eye $6\frac{3}{4}$, $2\frac{4}{5}$ in snout, subequal with interorbital; maxillary $\frac{4}{7}$ of eye; interorbital $7\frac{2}{5}$ in head from snout tip, low, depressed. Opercle with feeble, fine, longitudinal striae.

Rings 19+26, trunk $1\frac{3}{5}$ in tail or caudal section of body. Upper trunk keel not continuous with upper caudal keel, median lateral trunk keel continuous with lower caudal keel; median ventral trunk keel feeble, though distinct to vent. Trunk with auxiliary keel in each 3 intervals on side between fundamental keels.

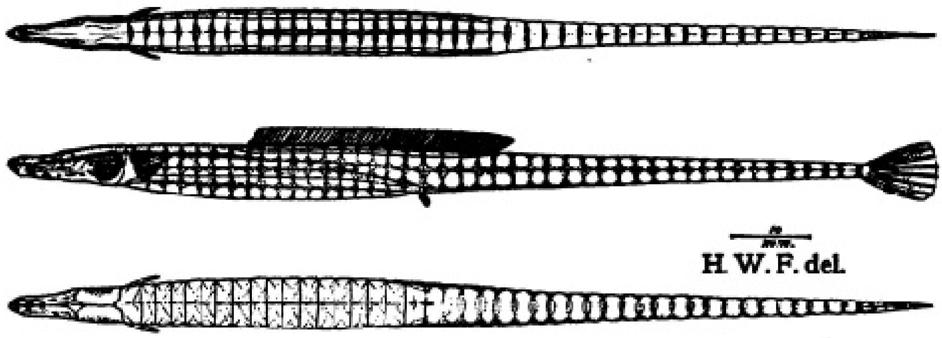


FIGURE 7.—*Parabelonichthys kellersi*, new species: Type (U.S.N.M. No. 108466).

D. 57, on 10 trunk and 5 caudal rings; A. small, about long as eye; caudal $1\frac{5}{8}$ in total head length; pectoral $3\frac{3}{4}$, rays 15.

Color in alcohol brownish, little contrasted. Dark brown longitudinal band, narrow, along side of snout, through eye and over postocular to gill opening. Fins largely uniform brownish. Caudal with two dark longitudinal bands, little divergent backward, and three dark spots marginally on fin above and below.

Distinctive characters largely included in the generic account above.

Type.—U.S.N.M. No. 108466. Jaro River, Panay Island. April 3–21, 1929. Lt. H. C. Kellers. Length 118 mm.

Paratypes.—U.S.N.M. No. 119443. Iloílo, Panay Island. April 17, 1929. Lt. H. C. Kellers. Length 92 mm. to end of broken tail.

U.S.N.M. No. 108468. Iloílo, Panay Island. April 19, 1929. Lt. H. C. Kellers. Length 110 to 118 mm., two examples.

(Named for Lt. Henry Clay Kellers.)

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Family SERRANIDAE

RHOMBOSERRANUS, new genus

Type.—Rhomboserranus gracilispinis, new species.

Body elongated, compressed, rhomboid, back little elevated. Caudal peduncle rather long, well compressed, much longer than deep. Head large, well compressed, upper profile little inclined. Snout short, tip level with middle of eye. Eye large, advanced in head, not entering upper profile. Maxillary reaches below eye, free, expanded posteriorly and without supplemental bone. Preorbital very narrow. Teeth in upper jaw very minute, in narrow bands with outer in larger series similar to single row below. Premaxillaries protractile. Interorbital low, concave, less than eye. Preopercle with denticulated edge, large spine at angle, one above and three below of which front one directed forward. Two divergent opercular spines, lower larger. Lower edge of subopercle with few denticles. Suprascapula serrated. Gill rakers lanceolate, slender, lower 15. Scales ctenoid, rather large. Cheek, opercles, and occiput scaly, rest of head naked. Small scales on chest, breast, and prepectoral region. Caudal base scaly. Dorsals and anals each with distinct basal scaly sheaths. Lateral line high, arched, concurrent with back, scales above in rows parallel with its course, below in horizontal series. Two dorsals, spinous fin much higher and with 8 spines. Anal like soft dorsal and opposite, of three spines, with second spine longest. Caudal moderate, little emarginate behind. Paired fins well developed, pectoral low and reaches front of anal and ventral with spine and five rays reaching vent. Coloration dull, silvery below.

A genus unique in its combination of characters, especially the rhomboid contour of the body, rather delicate spinous development and the plain coloration.

(ῥόμβος, rhomb + *Serranus*.)

RHOMBOSERRANUS GRACILISPINIS, new species

FIGURE 8

Depth 2½; head 2¼, width 2⅔. Snout 4¼ in head measured from upper jaw tip; eye 3⅓, exceeds snout or interorbital, close to but not entering upper profile of head; maxillary reaches halfway in eye, expansion 2 in eye, length 2⅖ in head from snout tip; mouth well inclined, lower jaw protruded in front externally and directed forward; 4 very short spines at front of each premaxillary; interorbital 4⅗ in head measured from snout tip, level to depressed medianly; preopercle with row of short spines along hind vertical edge, 3 on lower edge and 2 widely divergent spines at angle; opercle with 2 widely divergent spines, lower longer. Gill rakers 8 + 15, lanceolate, longer than gill filaments or 2 in eye.

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Tubular scales 44 in lateral line to caudal base, not continued on last; 5 scales above to spinous dorsal origin, 4 above to soft dorsal origin, 14 below to anal origin, about 19 predorsal forward until opposite hind pupil edge. On head small scales on postocular, predorsal, and cheek, on last in seven transverse rows to angle of preopercle keel and scales little larger than on opercle. Spinous dorsal with basal scaly sheath at each spine and small scales on bases of all rayed vertical fins and pectoral base. Small scales also on chest and breast, and on inner ventral bases.

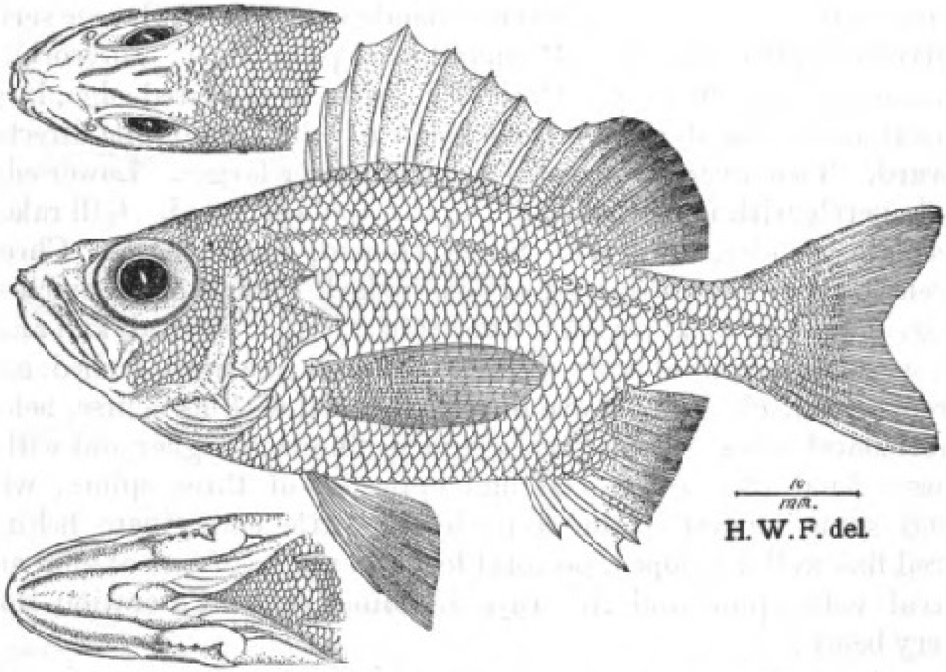


FIGURE 8.—*Rhomboserranus gracilispinis*, new species: Type (U.S.N.M. No. 99519).

D. IX, 10, I, fourth spine 2$\frac{1}{15}$ in total length of head, first branched ray 2$\frac{1}{3}$; A. III, 7, I, second spine 2$\frac{2}{5}$, second ray 3; caudal 1$\frac{1}{2}$, well emarginate behind; least depth of caudal peduncle 3$\frac{2}{3}$; pectoral 1$\frac{2}{5}$, rays I, 15; ventral rays I, 5, fin 1$\frac{2}{3}$ in total head length.

Color in alcohol largely uniform brown, little paler below. Iris pale to whitish. Soft dorsal, anal, and ventral dark to gray-black terminally. Inside gill opening and mouth cavity blackish brown.

Characters of distinction largely contained in the generic account.

Type.—U.S.N.M. No. 99519. D. 5273. Corregidor Light N. 27° E., 27.25 miles (lat. 13°58′45″ N., long. 120°21′35″ E.), China Sea, vicinity of southern Luzon. In 114 fathoms. July 14, 1908. Length 80 mm.

Paratypes.—U.S.N.M. No. 99520. D. 5273. Corregidor Light N. 27° E., 27.25 miles (lat. 13°58′45″ N., long. 120°21′35″ E.), China

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Sea, vicinity of southern Luzon. In 114 fathoms. July 14, 1908. Length 41 to 61 mm. Six examples.

U.S.N.M. No. 99521. D. 5266 [665]. Matocó Point, S. 22° E. 7 miles (lat. 13°44′36″ N., long. 120°59′15″ E.), Verde Islands Passage and Batangas Bay. In 135 fathoms. June 8, 1908. Length 49 to 65 mm. Nine examples.

(*gracile*, slender+*spina*, spine.)

SCHISTOPERCINAE, new subfamily

Type genus.—*Schistoperca*, new genus.

Known chiefly by its striking combination of characters, differing widely from all the Serranidae in its well divided and separated dorsals, spinescent scales, peculiar armature of the opercles, elongated pectorals, and long robust caudal peduncle.

SCHISTOPERCA, new genus

Type.—*Schistoperca macrobrachium*, new species.

Body rather oblong-elongate, well compressed. Caudal peduncle long, compressed, depth but little over half its length. Head moderate, well compressed, upper and lower profiles equally oblique and upper little undulated. Snout convex, rounded, broad. Eye moderate, advanced in head, close to but not entering upper profile. Maxillary reaches below eye, expansion free posteriorly and without supplemental bone. Premaxillaries protractile. Teeth very minute, in narrow band or row in jaws, not evident on palate. Preorbital very narrow. Interorbital low, level, subequal with eye. Preopercle with few small denticles along hind vertical edge and lower edge entire. Upper edge of antero-orbital and postero-orbital rim each with spine. Opercle with 3 backwardly directed spines, lowest largest and extends farther posteriorly. Lower edge of gill opening with 3 moderately curved spines, directed down and back. Suprascapula finely serrated. Gill rakers lanceolate, slender, rather numerous, longer than gill filaments. Scales ctenoid, large, very small on fins. Most of head scaly. Scales little smaller around gill opening below, on chest and breast. Lateral line highly arched, slopes much lower along side of caudal peduncle. Scale rows horizontal. Two distinct and well separated dorsal fins, second little higher. Anal like soft dorsal and opposite, preceded by 3 small slender graduated spines and third or last longest. Caudal moderate, forked. Pectoral greatly elongated, reaches beyond anal base. Ventral inserted below pectoral base, short, with spine and five rays. Coloration uniformly pale.

Characters of the genus included above, though the genus especially distinguishable by the greatly elongated pectorals.

(σχιστός, split, or divided, with reference to the dorsals+*Perca*.)

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SCHISTOPERCA MACROBRACHIUM, new species

FIGURE 9

Depth $3\frac{1}{2}$; head 3, width 2. Snout $5\frac{1}{8}$ in head measured from snout tip; eye $3\frac{2}{5}$, greater than snout, subequal with interorbital, snout tip level with middle of eye; maxillary reaches below first third in eye, expansion 2, length 3 in head from snout tip; lips rather broad, fleshy, smooth; mouth well inclined, lower jaw well protruding in front; teeth in jaws barely perceptible, very minute, feeble, inconspicuous; interorbital $3\frac{1}{5}$ in head measured from snout tip, moderate, convex; suborbital very narrow, ensheaths maxillary anteriorly; preopercle with hind edge furnished with row of few spinules. Lower edge of gill opening with 3 short backwardly curved spines. Gill opening large, extends forward below until opposite eye. Gill rakers 10+20, slender, lanceolate.

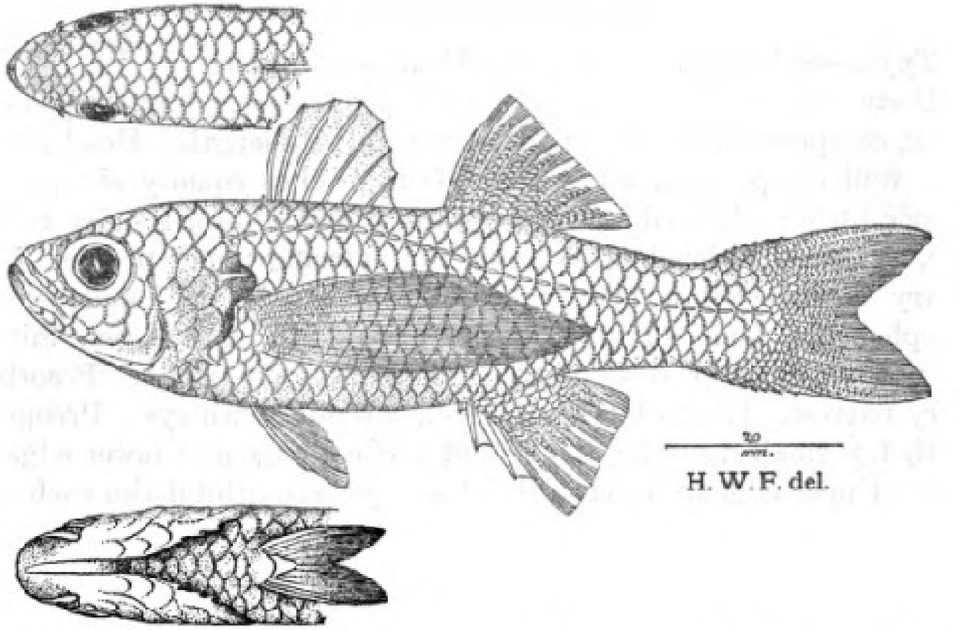


FIGURE 9.—*Schistoperca macrobrachium*, new species: Paratype (U.S.N.M No. 99531).

Scales 28+2 in lateral line; 3 above to second dorsal origin, 7 below to anal origin, 14 predorsal forward nearly to front of snout tip. Head well scaled, 2 rows on cheek. Vertical fins well covered with small scales over basal portions. Prepectoral region with scales smaller than on body and pectoral fins covered with small scales basally. Flap between ventrals formed of 2 large scales.

D. VIII—I, 8, I, fourth spine $2\frac{1}{8}$ in total head length, first branched ray 2; A. III, 7, I, third spine $2\frac{9}{10}$, first branched ray $1\frac{3}{4}$; caudal $1\frac{1}{10}$, moderately forked, with broad pointed lobes and fulcra series of distinct graduated spines; least depth of caudal peduncle

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2⅗; pectoral greatly extended, lower median rays longest, fin 2$\frac{1}{10}$ in fish without caudal, rays 12; ventral rays I, 5, fin 2 in total head length.

Color in alcohol largely uniform pale brownish, little paler below. Iris slate. Hind edge of gill opening rather broadly blackish brown. Fins uniformly pale. Inside gill opening and mandibular fold blackish.

Characters contained in the generic account above.

Type.—U.S.N.M. No. 99489. Tataán Pass, Simulac Island (south end of Basún Channel), Sulu Archipelago, Tawi Tawi Group. Shore collection. No. 4917. Length 100 mm.

Paratypes.—U.S.N.M. No. 99531. Tataán Pass, Simulac Island (south end of Basún Channel), Sulu Archipelago, Tawi Tawi Group. Shore collection. No. 4916. February 19, 1908. Length 99 mm.

U.S.N.M. No. 99533. D. 5216. Anima Sola Island, N. 44° W., 29.50 miles (lat. 12°52′ N., long. 123°23′30″ E.), between Burias and Luzon. In 215 fathoms. April 22, 1908. No. 2102. Length 95 mm.

U.S.N.M. No. 99529. D. 5423. Cagayan Island (S.), S. 11° E., 4.8 miles (lat. 9°38′30″ N., long. 121°11′ E.), Jolo Sea. In 508 fathoms. March 31, 1909. No. 3205. Length 86 mm.

U.S.N.M. No. 99532. D. 5296. Matocó Point, S. 63° E., 4.563 miles (lat. 13°40′09″ N., long. 120°57′45″ E.), China Sea, vicinity southern Luzon. In 210 fathoms. July 24, 1908. Nos. 2474, 2475. Length 68 to 77 mm. Two examples.

U.S.N.M. No. 99530. D. 5624. Makyan Island (S.), N. 67° W., 8.9 miles (lat. 0°12′15″ N., long. 127°29′30″ E.), between Gillolo and Makyan Islands, Dutch East Indies. In 288 fathoms. November 29, 1909. Nos. 4105, 4106. Length 89 to 90 mm. Two examples.

(μακρός, long+βραχίων, arm, or pectoral.)

Family SPARIDAE

Genus PENTAPODUS Cuvier

PENTAPODUS LINEOSCAPULARIS, new species

FIGURE 10

Depth 3½; head 3½, width 1⅞. Snout conic, pointed, tip in front level with lower edge of pupil, length 3½ in head; eye 3½, subequal with snout or interorbital, not entering upper profile of head; maxillary reaches opposite front eye edge, length 3¼ in head; mouth moderate, little inclined from horizontal, jaws equal in front; teeth uniserial in jaws, upper lateral uniform and small, lower laterals little enlarged medially and pair of canines in front of each jaw; interorbital 3⅓ in head, low, broadly convex. Gill rakers 2+6, short, de-

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pressed, flaplike, terminally spinescent, equal $\frac{2}{5}$ of gill filaments, which are half of eye.

Scales 41 in lateral line to caudal base; 3 above to first dorsal origin, 2 above to second dorsal origin; 15 predorsal scales; four rows of large scales over cheek to preopercle ridge, besides row of small ones along suborbital edge and three rows on preopercle flange. Basal half of caudal scaly, also pectoral base scaly.

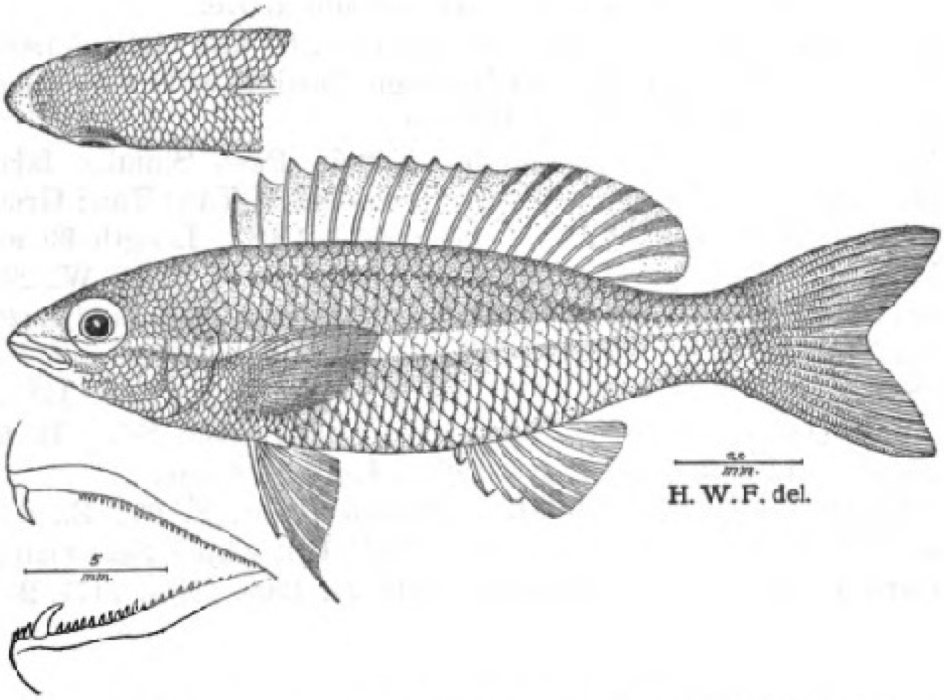


FIGURE 10.—*Pentapodus lineoscapularis*, new species: Type (U.S.N.M. No. 108465).

D. X, 9, I, first spine 4 in head, fourth spine $2\frac{1}{3}$, third ray $1\frac{9}{10}$; A. III, 6, I, third spine $3\frac{1}{8}$, first ray 2; caudal 1, emarginate behind; least depth of caudal peduncle $2\frac{2}{5}$; pectoral $1\frac{1}{3}$, rays 15; ventral rays I, 5, fin $1\frac{1}{6}$ in head.

Color in alcohol with back pale olive-brown and lower surfaces uniformly pale. Whitish longitudinal band from side of snout, including lower fourth of eye, back over pectoral origin and base of upper caudal lobe.

A species apparently unique in its coloration as a white band extends from the side of the preorbital, including the lower edge of the eye, and then back along the middle of the side to the caudal peduncle. Also a gray white bar or line from the beginning of the lateral line and vertically above the origin of the pectoral, which has a blackish spot.

Type.—U.S.N.M. No. 108465. Iloílo, Panay Island. May 9, 1929. Lt. H. C. Kellers. Length 135 mm.

(*linea*, line + *scapula*, scapula.)

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Family CIRRHITIDAE

Genus CYPRINOCIRRHITES Tanaka

CYPRINOCIRRHITES STIGMA, new species

FIGURE 11

Depth 2⅘; head 2⅘, width 2$\frac{1}{10}$. Snout short, broad, convex, length 6¼ in head measured from snout tip, which is level with lower edge of pupil; eye 3⅙, greatly exceeds snout or interorbital but not invading upper profile of head; orbit 2¾ in head as measured from snout tip; maxillary reaches below front eye edge, expansion 2⅞ in eye, length 3⅔ in head from snout tip; teeth minute, simple, in narrow bands in jaws, uniform or without enlarged canines; no teeth evident on palate; interorbital 5½, low, broadly convex; hind preopercle edge well inclined forward, with 14 uniform strong close-set denticles; suborbitals narrow, entire. Gill rakers 4+10, slender, lanceolate, long as gill filaments or longer.

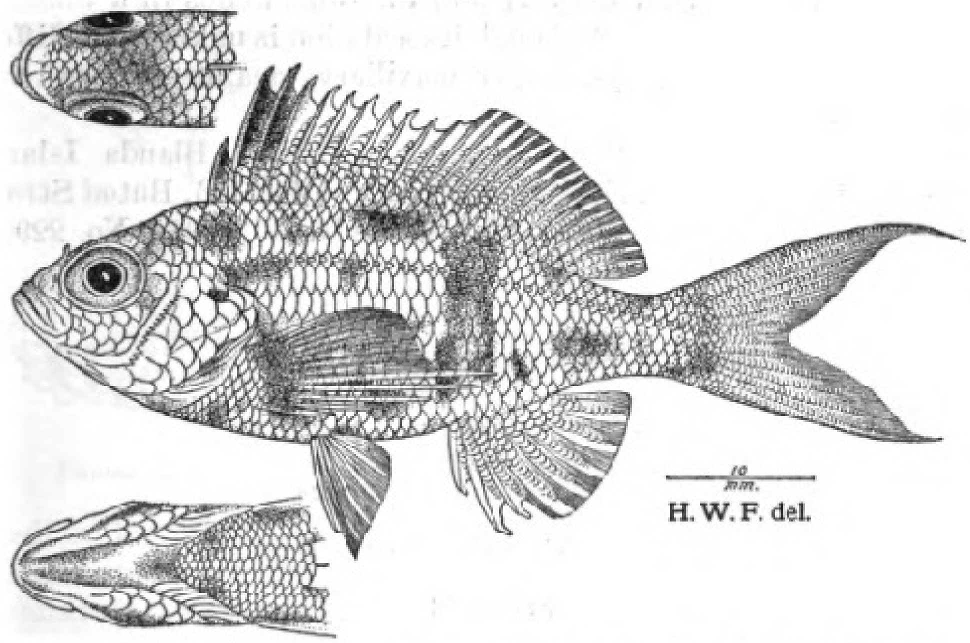


FIGURE 11.—*Cyprinocirrhites stigma*, new species: Type (U.S.N.M. No. 99505).

Scales 38 in lateral line to caudal base; 4 scales above to first dorsal origin, 9 below to anal origin; 14 predorsal forward to front of snout; 3 rows of scales on cheek; large scales on opercles. Small scales on chest, breast, and prepectoral region. Bases of vertical fins all finely scaled, also small scales on pectoral basally.

D. XI, 17, I, first spine 4 in total head length, third spine 1¾; A. III, 6, I, second spine 2, second ray 2, caudal 2⅗ in rest of fish,

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deeply forked and each lobe ending in sharp slender point; pectoral 2⅔, rays 9, v; least depth of caudal peduncle 3 in total head length; ventral 1⅞, rays I, 5.

Color in alcohol brown, becoming whitish on under surfaces. Six large, irregular blackish brown blotches on back and below fourth two dark vertical bands. Two dark blotches on trunk along lateral line. Row of five or six dark blotches along side of tail. Blackish transverse band at caudal base and another at pectoral base. Small dark spot on opercle above. Black on first three membranes of spinous dorsal terminally. Fins otherwise pale or light brown.

Differs from *Cyprinocirrhites ui* Tanaka [6] in the larger eye, shorter maxillary, large subterminal black blotch on second and third membranes of first dorsal, tip of snout on level with lower edge of pupil, lower edge of preopercle entire, fins all more or less scaly basally, long pectoral reaching over halfway to caudal base and a dark bar on caudal and pectoral bases. Quite likely the imperfectly described and figured *Cirrhitichthys polyactis* Bleeker [7] may belong in *Cyprinocirrhites* as it has D. X, 16 or 17 and the caudal ends in a filament above and another below. Although its scalation is unknown it differs in proportions, smaller eye, larger maxillary, smaller pectoral and different fins.

Type.—U.S.N.M. No. 99505. D. 5640. Labuan Blanda Island, N. 88° E., 1 mile (lat. 4°27′00″ S., long. 122°55′40″ E.), Buton Strait, Dutch East Indies. In 24 fathoms. December 13, 1909. No. 22920. Length 62 mm.

(στίγμα, blotch.)

Family SCORPAENIDAE

Subfamily Scorpaeninae

Genus SCORPAENA Linnaeus

SCORPAENA TAENIOPHRYS, new species

Figure 12

Depth 2½; head 2⅕, width 1½. Snout very broad, depressed, front end level with lower eye edge, length 4½ in head measured from snout tip; eye 3¾, greater than snout or interorbital, close to but not entering upper profile of head; maxillary reaches below hind eye edge, expansion 1⅔ in eye, length 2 in head from snout tip; mouth little inclined from horizontal, lower jaw slightly pro-

[6] Zool. Mag. Tokyo, vol. 29, No. 347, p. 268, 1917 (type locality: Tanabe, Province of Kii); Figures and descriptions of the fishes of Japan, ed. 2, p. 507, pl. 137, fig. 384, 1935 (type).

[7] Nat. Verh. Kon. Akad. Wetens. Amsterdam (Cirrhit.), vol. 15, p. 16, 1875 (type locality: Amboina); Atlas ichthyologique des Indes orientales Néerlandaises, vol. 8, p. 147, pl. 76, fig. 1, 1876–77 (type).

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truding in front; teeth in villiform bands in jaws, also present on palatines; bony interorbital width 6⅘ in head measured from snout tip, concave. Gill rakers 5+10, robust, short, clavate, ⅔ long as gill filaments, which about equal pupil.

Pair of small nasal spines; short and low antero-supraorbital spine up and backward, and 2 broad low and rather large postero-supraorbitals each side, closely set, with finely serrated edges all more or less directed back; pair of similar strong nuchal spines close behind last postero-supraorbital; parietal and occipital spines form strong keel, slightly divergent backward with rather deeply concave

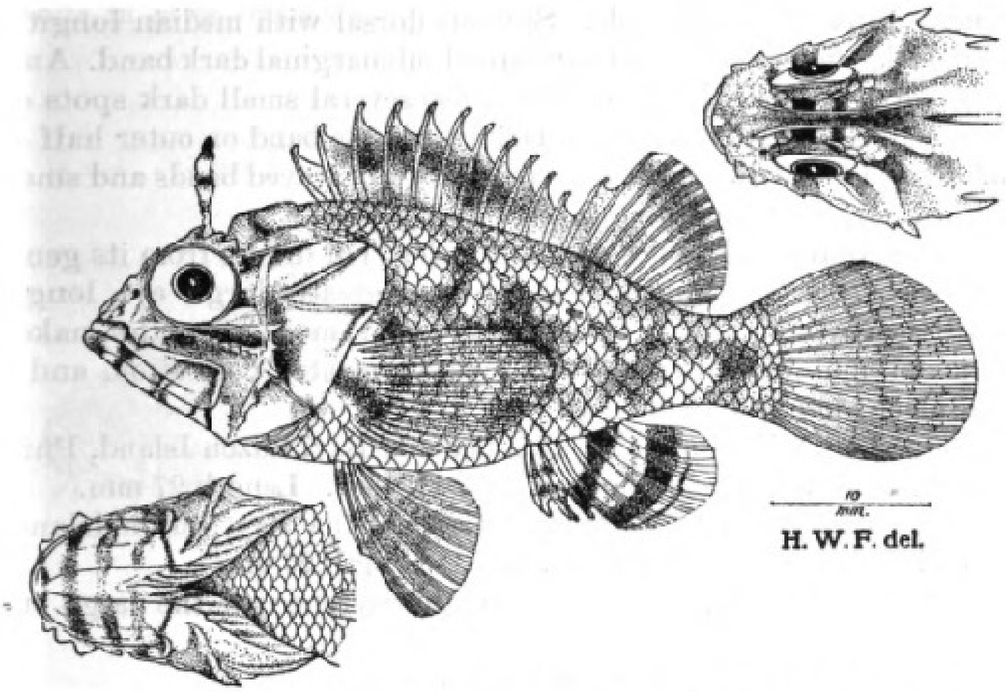


FIGURE 12.—*Scorpaena taeniophrys*, new species: Type (U.S.N.M. No. 99522).

median depression; row of three broad, short and rather large pre-orbital spines, posterior still little larger and directed down; sub-orbital stay with two very small spines; five spines along hind edge of preopercle, uppermost extending back from hind edge of subor-bital stay; two very small little-developed postocular spines; two widely divergent opercular spines; humeral spine broad, obtuse.

Scales 37+2 in lateral line; 13 developed tubes form lateral line followed by 3 pores and last pore on caudal base; 4 scales above lateral line to second dorsal origin, 10 below to anal origin. Head, predorsal, and prepectoral region naked. Chest and breast with small scales. On fins only caudal base scaly. Lateral line complete, slopes obliquely down to caudal peduncle. Long supraorbital flap little longer than eye and no other flaps on head or body.

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D. XII, 11, first spine 5¼ in total head length, fifth spine 2¾, second ray 2⅓; A. III, 5, third spine 3⅖, third ray 2⅙; caudal 1⅗, convexly rounded behind; least depth of caudal peduncle 3⅗; pectoral 1½, all 15 rays simple; ventral rays I, 5, fin 1⅔ in total head length, spine 3⅕.

Color in alcohol brown, variegated with darker on head and body. Three rather conspicuous, irregular, blackish-brown blotches along lateral line. On lower surface of head, inclusive of maxillary and mandible five dark transverse bands, all much narrower than interspaces. Dark band across interorbital and reflected down below eye on suborbital. Another narrower one connects postero-supraorbital spines. Fins all largely pale. Spinous dorsal with median longitudinal dark band. Soft dorsal with broad submarginal dark band. Anal with two broad dark inclined bands, also several small dark spots on spinous fin. Caudal with broad dark transverse band on outer half of fin. Paired fins with dark transverse narrow or waved bands and small inclined dark blotch on pectoral base.

Belongs in the subgenus *Osorioia* Fowler [8] but differs from its genotype *Scorpaena hemilepidota* Fowler in its greatly larger eye, longer maxillary reaching opposite the hind eye edge, moderate scales, naked predorsal, more dorsal spines and rays, variegated coloration, and a large black blotch on first dorsal.

Type.—U.S.N.M. No. 99522. Cammahana Bay, Luzon Island, Philippines. Taken in beach seine. March 11, 1909. Length 27 mm.

Paratype.—U.S.N.M. No. 99523. Cammahana Bay, Luzon Island. Taken in beach seine. March 11, 1909. Length 25 mm.

(*ταινία*, ribbon+*ὀφρύς*, eyebrow, with reference to the large supraorbital flaps.)

Subfamily MINOINAE

PARAMINOUS, new genus

Type.—*Paraminous quincarinatus*, new species.

Greatly like *Minous* Cuvier superficially, though without the long preopercular spine, much smaller and different preorbital spine, different sculpturing on the head, more numerous cutaneous flaps as those on supraorbital and mandible, shorter body, longer pectoral and different coloration.

Minous inermis Alcock [9] apparently belongs in this genus as *Paraminous inermis* (Alcock), showing a similar armature, a greatly longer pectoral and a much longer detached pectoral ray, details doubtless of specific value.

(*παρά*, near+*Minous*.)

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[8] Proc. U. S. Nat. Mus., vol. 85, p. 63, 1938.

[9] Journ. Asiatic Soc. Bengal, vol. 58, pt. 2, p. 299, pl. 22, fig. 4, 1889 (type locality: Bay of Bengal).

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PARAMINOUS QUINCARINATUS, new species

FIGURE 13

Depth 3; head 2¼, width 1½. Snout broad, depressed forward with front snout end forming well below level of eye or orbit, length to eye (in profile) 2⅞ in head measured from snout tip; eye 5, 1⅞ in snout, 1³⁄₇ in interorbital, close to but not entering upper profile of head; orbit 3½ in head measured from upper jaw tip; maxillary reaches halfway below eye, expansion equals eye, length 2⅖ in head measured from snout tip; mouth large, broad, little inclined from horizontal, lower jaw slightly protruding in front; teeth in villiform bands in jaws, band above much broader; similar band transversely

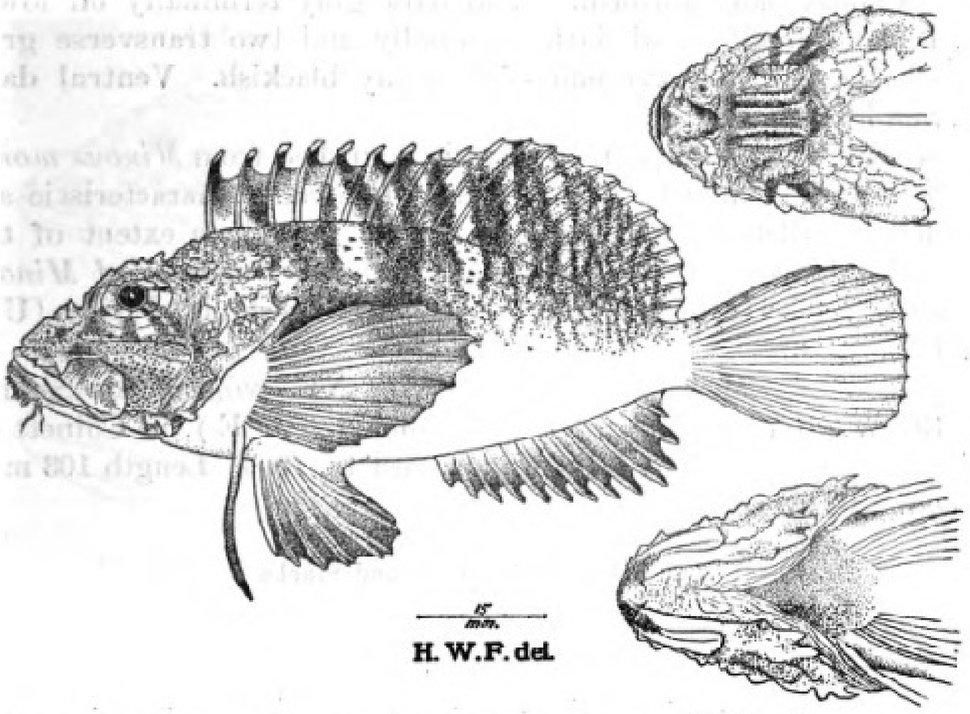


FIGURE 13.—*Paraminous quincarinatus*, new species: Type (U.S.N.M. No. 99515).

across vomer, constricted medially; interorbital 3⅖, concavely depressed. Gill opening large, extends forward opposite middle of eye. Gill rakers 4+9, clavate, robust, long as gill filaments, which are ⅓ of orbit.

Armature of head quite robust, with many ridges finely serrate or rugose and spines broad, low and strong; pair of broad low nasal spines; supraorbital spines little differentiated as antero-preorbital pair and two close-set postero-supraorbital pairs; nuchal and supraoccipital pairs low, with last better developed; three or four preorbitals, last best developed and directed downward; spines on suborbital stay irregular and low; preopercle with five spines, first below

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smallest and directed down; two small rather closely set short opercular spines, directed back.

Body scaleless. On back small, inconspicuous, scattered, short filamentous points. Along lower front edge of mandible uneven fringe of cutaneous filaments, posterior longest.

D. IX, 13, first spine 3⅗ in total head length, third ray 2¼; A. II, 11, second spine 5¾, eighth ray 2⅞; caudal 1⅖, hind edge convexly rounded; least depth of caudal peduncle 4⅖; pectoral 1⅓, rays I, 11; ventral rays I, 5, fin 1⅘ in total head length.

Color in alcohol brown, variegated with darker on back, forming two broad vertical blotchlike bands below first dorsal and five bands transversly on second dorsal. Six dark brown bands radiate from eye. Caudal pale, uniform. Anal dark gray terminally on lower border of fin. Pectoral dark terminally and two transverse gray bars basally, with lower end of free ray blackish. Ventral dark gray on lower border.

A very distinct species and easily distinguished from *Minous monodactylus* (Schneider) by its armature. Especially characteristic are the five parallel longitudinal keels within the whole extent of the interorbital space. Comparison made with two examples of *Minous monodactylus*, 114 to 117 mm. long from Kagoshima, Japan (U.S. N.M. No. 71667).

Type.—U.S.N.M. No. 99515. D. 4930. NE. point Yaku Shima, N. 19° W., 10.7 miles (lat. 30°12′N., long. 130°44′E.), in Colnett or Vincennes Strait. In 84 fathoms. August 15, 1906. Length 103 mm.

(*quintus*, five + *carina*, keel.)

Genus OCOSIA Jordan and Starks

OCOSIA GRACILE, new species

FIGURE 14

Depth 3¼; head 2⅗, width 1⅞. Snout long, broad, rather pointed front end forms well below level of eye, length 1⅞ in head measured from snout tip; eye $4\frac{1}{10}$, 1½ in snout, greatly exceeds interorbital, high but not entering upper profile of head; orbit 3⅕ in head as measured from snout tip; maxillary reaches below first third of eye, expansion 2 in eye, length 2⅔ in head measured from snout tip; mouth large, little inclined from horizontal, lower jaw little protruded in front; lips broad, fleshy, smooth; teeth in villiform bands in jaws, upper band little broader; broad bands of villiform teeth on vomer and palatines; bony interorbital width ⅗ of eye or 8⅔ in head as measured from snout tip; preorbital with 2 spines, both directed backward and upper much longer; 4 spines along hind edge of preopercle, uppermost largest. Gill opening large, deeply cleft and extends forward opposite middle of eye. Gill rakers 3 + 6, rather robust, tuberculiform, barely half long as gill filaments which are 2⅔ in eye.

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No scales. Skin smooth, entire, without any flaps or filaments. Lateral line complete, high, mostly concurrent with upper profile of body.

D. XV, 9, edge of spinous fin deeply notched terminally behind each spine, first spine 6 in total head length, second spine 2⅛, last spine 3⅓, third ray 2¼; A. 8, first ray 6⅕, fifth ray 2⅙; caudal 1⅔, convex behind; least depth of caudal peduncle 5; pectoral 1½, with 13 simple rays; ventral rays I, 5, rays bifid, fin 1⅞ in total head length.

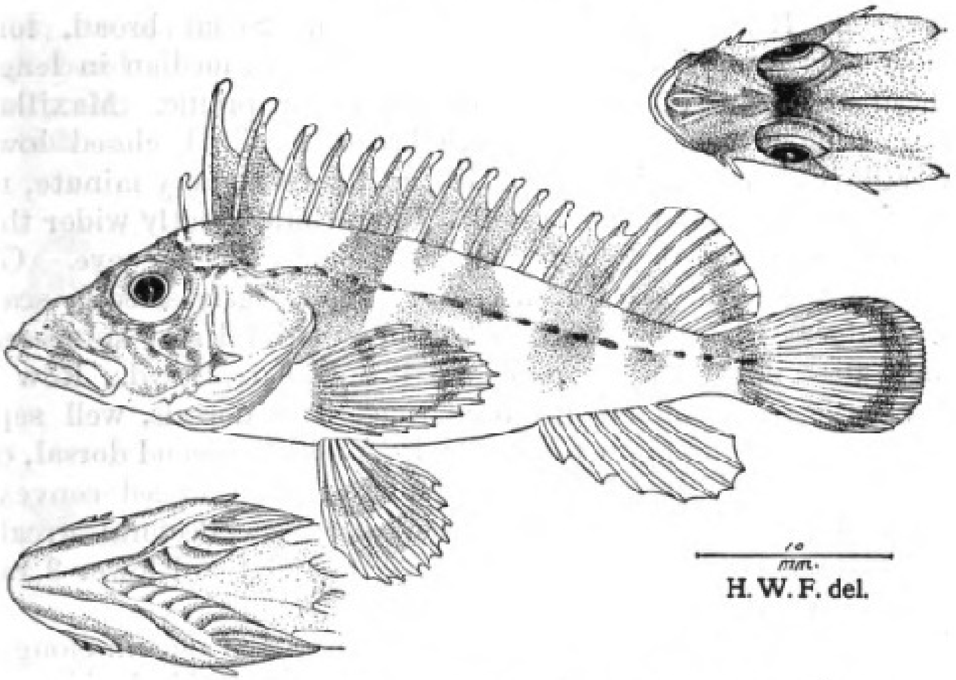


FIGURE 14.—*Ocosia gracile*, new species: Type (U.S.N.M. No. 99513).

Color in alcohol pale gray above, whitish below. Six large dark gray blotches on back, of which five extend on vertical fins and sixth reflected on upper posterior part of second dorsal. Caudal with dark basal bar and dark submarginal band concurrent with hind edge. Pectoral with large dark basal blotch, two small spots above and broad hind submarginal band. Two dark transverse bands on ventral. Head with variable dark spots on side.

Differs from *Ocosia vespa* Jordan and Starks [10] in the lower body, lower dorsal, longer maxillary and different coloration.

Type.—U.S.N.M. No. 99513. D. 4903. Ose Saki Light, N. 22°E., 6 miles (lat. 32°31′10″ N., long. 128°33′20″ E.), 10 to 20 miles SW. of Goto Islands, Eastern Sea. In 139 fathoms. August 10, 1906. Length 46 mm.

Paratype.—U.S.N.M. No. 99514. D. 4903. Ose Saki Light, N. 22° E., 6 miles (lat. 32°31′10″ N., long. 128°33′20″ E.), 10 to 20 miles SW.

[10] Proc. U. S. Nat. Mus., vol. 27, p. 162, fig. 17, 1904 (type locality: Sagami Bay.)

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of Goto Islands, Eastern Sea. In 139 fathoms. August 10, 1906. Length 39 mm.

(*gracile*, slender.)

Family OPLICHTHYIDAE

ACANTHOPLICHTHYS, new genus

Type.—Acanthoplichthys pectoralis, new species.

Body well elongated and depressed, depth less than half of greatest width. Head large, broadly depressed. Snout broad, long, broadly obtuse in front. Eye small, supralateral, median in length of head and close to but not invading upper profile. Maxillary reaches below front of eye. Mouth broad, terminal, closed lower jaw slightly shorter or included. Teeth, if present, very minute, not evident, and jaws and palate smooth. Interorbital greatly wider than eye. Gill opening very large, extends forward below eye. Gill rakers small low tubercles, rather few. Skin largely smooth, scaleless. Ridges of head above and edges of suborbital stay spinescent, though all spines on head small and little differentiated. Row of rather large spines all along lateral line. Two dorsals, well separated, first small and lower than second. Anal like second dorsal, opposite, its rays all little longer. Caudal small, rounded convexly behind. Caudal peduncle small, slender, free. Pectoral greatly elongated, reaches halfway to hind edge of caudal and lower 3 rays detached. Ventral short, not reaching anal.

Approaches *Rhinhoplichthys* Fowler in the large smooth elongate areas on the head before the eyes and the broad interorbital width. It differs at once in the greatly extended pectorals.

(ἄκανθα, spine+*Hoplichthys*, with reference to its spinescent armature.)

ACANTHOPLICHTHYS PECTORALIS, new species

FIGURE 15

Depth 8¾; head 2⅗, width 1⅓. Snout 2⅖ in head; eye 8, 3⅓ in snout, 1⅔ in bony interorbital width; maxillary reaches front eye edge, length 2⅖ in head; mouth width 2⅘, lower jaw shorter than upper and included when closed; teeth not made out, jaws and palate smooth; bony interorbital width 5 in head, low, level. Gill rakers 3+5, short, low tuberclelike knobs, greatly lower than gill filaments.

Frontal ridges, also parietal, occipital and postocular with rows of small spines or spinules. Two divergent spinescent ridges on opercle. Suborbital stay with spinescent edges and two long spines at angle

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of preopercle. Lateral line with 26 large spines, much larger than those on head.

D. VI—15, I, third 3¾ in head, first ray of second fin 3⅛, last ray 6⅛; A. 16, I, second ray 3, last ray 6⁴⁄₇; caudal 2⅔, elongate, convex behind; least depth of caudal peduncle 10½; pectoral 1, rays 11, III; ventral I, 4, fin 2 in head.

Color in alcohol pale to light brown, largely whitish below. Back with four large dark blotches, all reflected on bases of dorsals. Some dark-gray diffuse spots on head. First dorsal largely gray black, its upper border whitish. Second dorsal with submarginal dark band. Caudal with two dark basal blotches, one above the other, and hind border of fin blackish. Fins otherwise pale to whitish.

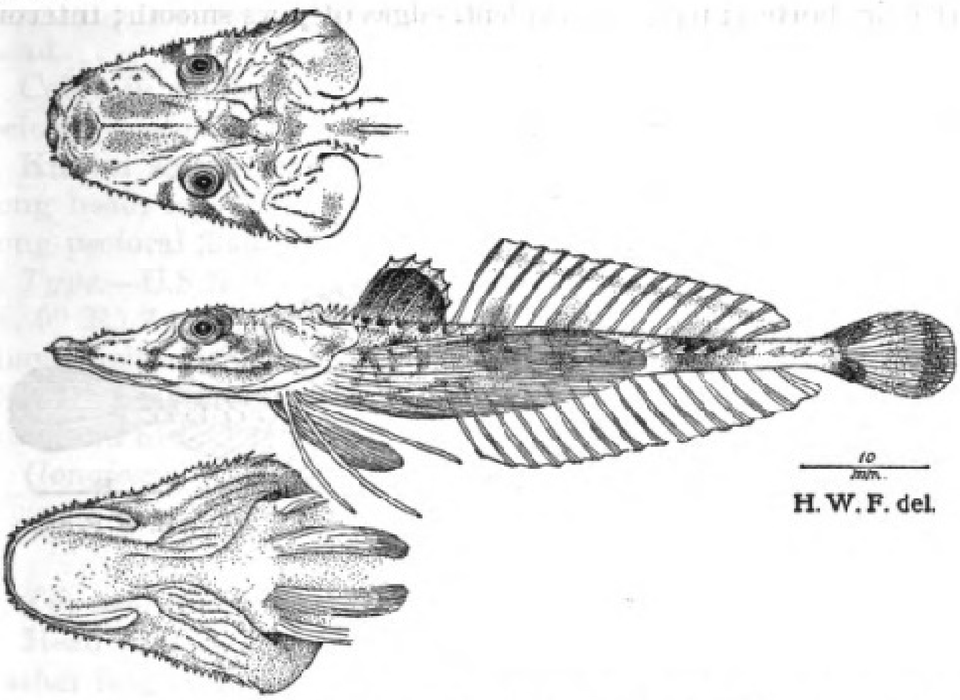


FIGURE 15.—*Acanthoplichthys pectoralis*, new species: Type (U.S.N.M. No. 99503).

Greatly suggestive of the Australian *Rhinhoplichthys haswelli* (McCulloch) and the Hawaiian *Rhinhoplichthys platophrys* (Gilbert) but differs from both in the greatly longer pectorals and the first dorsal rays.

Type.—U.S.N.M. No. 99503. D. 5440. San Fernando Point Light, N. 82° E., 23.1 miles (lat. 16°33′52″ N., long. 119°52′54″ E.), west coast of Luzon. In 172 fathoms. May 10, 1909. No. 3547. Length 73 mm.

(*pectoralis*, pectoral, with reference to the greatly developed pectoral fins.)

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Family PERISTEDIIDAE

Subfamily PERISTEDIINAE

Genus PERISTEDION Lacepède

PERISTEDION LONGICEPS, new species

FIGURE 16

Depth 5⅗ in body measured from snout tip inside rostral extensions; head 2½, width 1½. Snout 2 in head; eye 5⅞, 3 in snout, 1⅙ in interorbital; orbit 5 in head measured from snout tip inside rostral extensions; maxillary length 5⅙, reaches ¾ in snout length as measured to eye; 3 pairs of barbels, front pair simple and longer posterior pair with several filaments, its length 2 in snout and mandibular pair shortest; teeth not evident, edges of jaws smooth; interor-

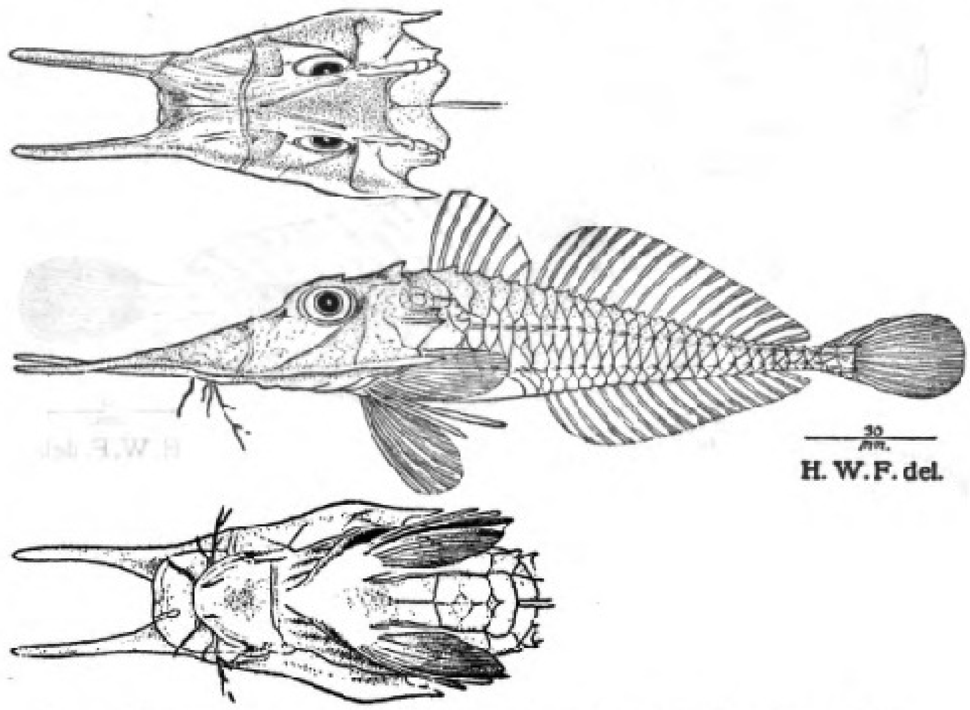


FIGURE 16.—*Peristedion longiceps*, new species: Type (U.S.N.M. No. 99516).

bital 4⁴⁄₇ in head measured from snout tip inside rostral extensions, broadly concave. Gill rakers 7+22, lanceolate, longer than gill filaments or 2½ in orbit; several upper gill filaments rudimentary.

Pair of very slender, slightly diverging rostral extensions, each little longer than snout, separated by broad interspace with narrowest part of contraction much wider than either of extensions; single low, strong, backwardly directed supraorbital spine each side;

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large occipital spine with rather long base each side; postocular keel ends in blunt suprascapular spine; opercle with 2 keels diverging backward, lower horizontal and longer or long as eye, both ending in short spine; keel of suborbital stay entire, nearly straight or but little undulous; preopercle ends in long strong spine 1⅛ in eye.

From above gill opening 30+1 bony lateral plates; 4 rows of diminishing spiniferous plates on trunk; spines all large, strong, erect and with surfaces finely rugose or striate; hind pair of plates on belly before vent 1⅓ length of front pair; arc of 5 small scutes from over gill opening downward.

D. VII—17, first spine 3⅖ in head, fifth ray 3⅛; A. 17, fifth ray 4; caudal 2½, convex behind; least depth of caudal peduncle 2¼ in eye; pectoral 3⅛ in head, rays I, 10—II, upper detached ray 2 in head and reaches 1¼ to anal origin; ventral rays I, 5, fin 2⅒ in head.

Color in alcohol largely pale or light uniform brownish, paler below. Iris pale. Fins immaculate like body.

Known among all the representatives of its family by the very long head, longer than the rest of the body, the armature and the long pectoral filaments longer than the pectoral fin.

Type.—U.S.N.M. No. 99516. D. 5374. Tayabas Light (outer), N. 9° E., 7.4 miles (lat. 13°46′45″ N., long. 121°35′08″ E.), Marinduque Island and vicinity. In 190 fathoms. March 2, 1909. No. 24281. Length 195 mm. from end of broken frontal projections to hind end of broken caudal.

(*longiceps*, long head.)

ACANTHOSTEDION, new genus

Type.—*Acanthostedion rugosum*, new species.

Head as seen from above rather elongately hexagonal. Pair of rather long rostral extensions in form of isosceles triangle, subequal with or slightly less than snout in length. Eye large, supralateral, in posterior half of head. Maxillary short. Mouth small. Two pairs of rather small barbels, posterior longer branched. Interorbital concave. Preopercular spine very long, reaches well posterior in pectoral fin or close before anal fin origin, greatly posterior to end of small opercular spine. Large, though short and strong postero-supraorbital spine. Pair of very long, inclined, and prominent occipital spines, reaching far into first dorsal fin. Dorsal with five spines, fin subequal in height with second dorsal. Anal opposite and similar to second dorsal. Caudal slightly emarginate behind. Pectoral moderate, reaches into front of anal, two lower detached rays subequal in length with upper rays. Ventral longer than pectoral, reaches anal. Coloration uniform.

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A genus of peristediids known by its greatly developed spines, as frontal, supraorbital, occipital, opercular and preopercular pairs, besides the spiny series on the body and all more or less rugose striate. Also all the barbels small and anterior simple. Very conspicuous and distinctive are the exceptionally long pair of occipital spines, well-inclined back.

(ἀκανθα, spine + στηθίον, from *Peristedion.*)

ACANTHOSTEDION RUGOSUM, new species

FIGURE 17

Depth 5 in body as measured from snout tip inside rostral extensions; head 1⅞, width 1⅓. Snout 2½ in head; eye 5, 2 in snout, 1 in interorbital; maxillary extends halfway to eye, length 7⅗ in head; mouth width 3⅛; anterior mandibular barbel 7, posterior 2⅖, front pair simple; mouth edentulous; interorbital 4¾, concavely depressed. Gill rakers 8+20?, finely lanceolate, over twice gill filaments or 2 in eye.

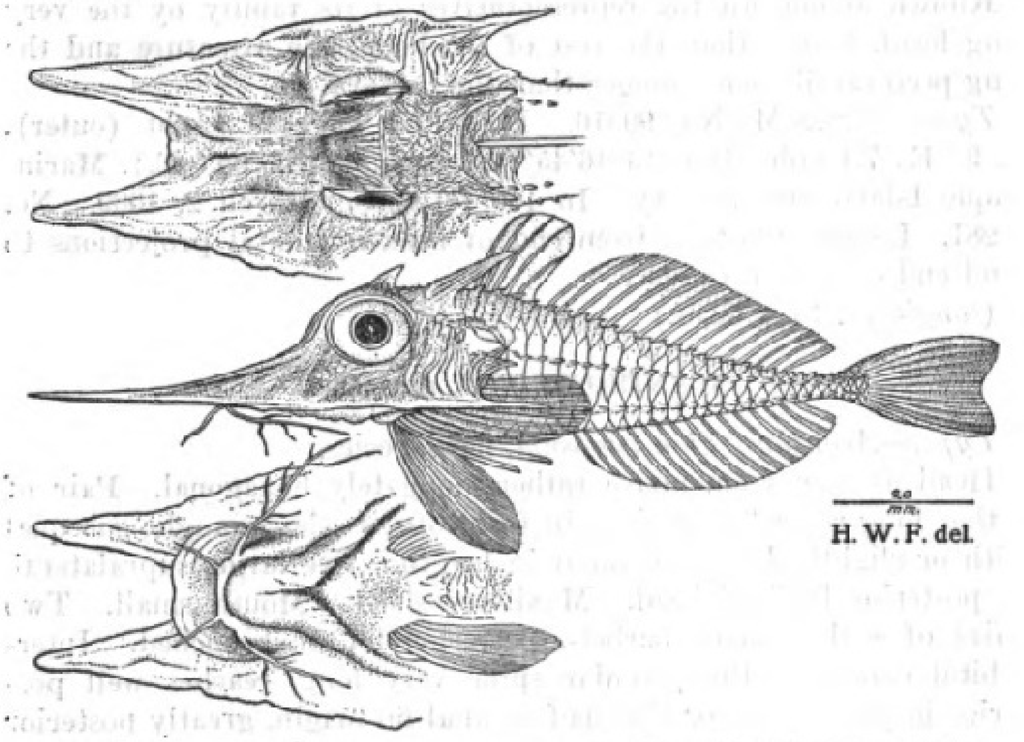


FIGURE 17.—*Acanthostedion rugosum*, new species: Type (U.S.N.M. No. 99501).

Pair of long isosceles triangular extensions, flat or depressed, moderately wide interspace about ¾ to ⅘ of basal width of either extension; large postero-supraorbital spine half of eye diameter in length, its front edge finely serrated; very long, strong, inclined occipital spine 1+⅛ times eye diameter, extends back to base of last dorsal spine; opercular spine moderate or small, without distinct keel for-

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ward; keel of suborbital stay with undulous and very finely serrated edge and ends behind in long extended spine nearly long as eye.

Beginning over gill opening 29+1 bony lateral plates; 4 rows of diminishing spiniferous plates on trunk; spines all quite large, strong, well erected, and surfaces of plates finely rugose; bones of head all well striate on upper surfaces, rugose on cranium and most of bony ridges of head minutely serrate; arc of five small and little-developed scutes formed over gill opening and down posteriorly.

D. V—16, third spine 3$\frac{9}{10}$ in head, fifth ray 3$\frac{7}{8}$, last ray 7; A. 16, seventh ray 4$\frac{2}{5}$; caudal 2$\frac{3}{4}$, slightly emarginate behind; least depth of caudal peduncle 16; pectoral 3$\frac{2}{5}$, rays II, 11; ventral rays I, 5, fin 2$\frac{1}{10}$ in head.

Color in alcohol largely uniform pale or light brown, no markings. Characters contained in the generic account.

Type.—U.S.N.M. No. 99501. D. 5121. Malabrigo Light, N. 14° W., 9 miles (lat. 13°27′20″ N., long. 121°17′45″ E.), east coast of Mindoro. In 108 fathoms. February 2, 1908. Length 67 mm.

Paratype.—U.S.N.M. No. 99502. D. 5121. Malabrigo Light, N. 14° W., 9 miles (lat. 13°27′20″ N., long. 121°17′45″ E.), east coast of Mindoro. In 108 fathoms. February 2, 1908. Length 55 to 63 mm. [83.] Seven examples.

(*rugosum*, roughly granular.)

Family POMACENTRIDAE

Subfamily CHROMINAE

SERRICHROMIS, new genus

Type.—*Dascyllus pomacentroides* Kendall and Goldsborough.

Body elongately ovoid, back little elevated. Head moderate, deep, compressed. Snout short, broad, blunt. Eye large, supralateral. Mouth cleft short, terminal, with lower jaw slightly protruded and snout tip level with lower edge of pupil. Lips narrow, entire. Teeth in jaws firmly erect, conic, pointed, strong, outer row little enlarged and also strong inner irregular band of one to three variable rows, outer row extending well down along lower edge of maxillary; below inner small teeth best developed in front part of jaws. Maxillary reaches eye. Preorbital and infraorbitals narrow, only edge of former free as mouth opens and edges nowhere with serrae. Preopercular edge serrate around angle. Interorbital convex. Gill rakers about 10+20, finely lanceolate, slender, slightly shorter than gill filaments, which are ½ of eye. Scales moderate, on head without basal auxiliaries and very compact over head, on snout extending forward to its front edge and covering mandible. Tiers of scales extend up over membranes of spinous dorsal and all soft vertical fins well and

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finely scaled basally. Ventral with pointed axillary scale half length of fin spine. Lateral line with long exposed simple tubes in upper section. First dorsal lower than second, with 12 spines and edge of each membrane notched, rays 11. Anal with 2 spines and 11 rays. Caudal emarginate. Pectoral shorter than ventral.

Though the genotype was originally included in *Dascyllus* it has little in common with the Dascyllinae. It seems to me more closely related to the various genera of the Chrominae, and is especially distinguished by its serrated preopercle, strong dentition and combination with other characters.

(*serra*, saw + *Chromis*.)

SERRICHROMIS POMACENTROIDES (Kendall and Goldsborough)

Dascyllus pomacentroides Kendall and Goldsborough, Mem. Mus. Comp. Zool., vol. 26, p. 298, pl. 5, fig. 1, 1911 (type locality: Taritari, Gilbert Islands).

Pomacentrus pomacentroides Fowler, Mem. B. P. Bishop Mus., vol. 10, p. 315, 1928 (type).

The type (U.S.N.M. No. 65812) examined.

LEPICEPHALOCHROMIS, new genus

Type.—*Chromis cupreus* Fowler and Bean.

Teeth with main row of large simple conic ones in each jaw; inside a band of irregular small ones, one to three transverse series for almost whole of upper jaw and in lower jaw similar band only anteriorly. Head with many small scales around eye on chin, along edge of preopercle flange, lower inner edges of head forming gill opening and at bases of all of scales on top of head. Each tube of lateral line well exposed, with several very short anal tubes or branches both above and below. Gill rakers 9+25, lanceolate, little shorter than gill filaments, which are ¾ of eye. Preorbital edge not free. Preopercle edge well free, distinct and entire. Pectoral axil dark brown.

Apparently related to *Chromis* in its largely uniform coloration, without the blue spots of *Heliases*, though agreeing with the latter in the possession of 13 dorsal spines. It also appears to be distinguished by the small scales on the cheek in 8 rows, besides the very small and crowded scales elsewhere on the head.

(λεπίς, scale + κεφαλή, head + *Chromis*.)

LEPICEPHALOCHROMIS CUPREUS (Fowler and Bean)

Figure 18

Chromis cupreus Fowler and Bean, Proc. U. S. Nat. Mus., vol. 63, p. 22, 1923 (type locality: Fiji or Samoa).—Fowler, Mem. B. P. Bishop Mus., vol 10, p. 309, 1928 (type); Proc. Amer. Philos. Soc., vol. 82, No. 5, p. 784, 1940 (type).

The type (U.S.N.M. No. 83108) examined.

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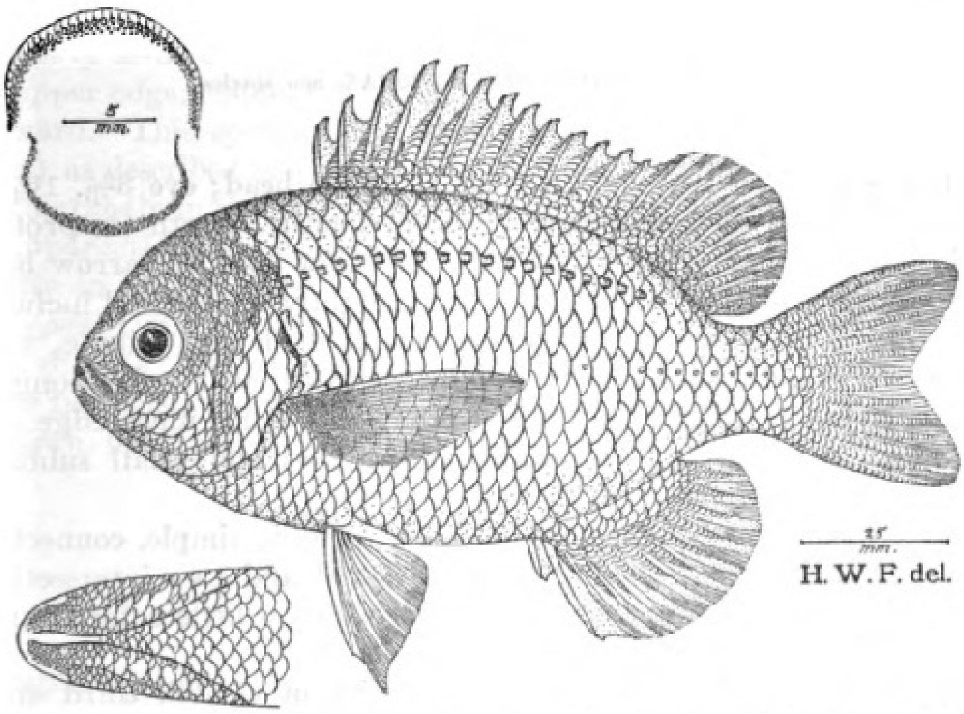


FIGURE 18.—*Lepicephalochromis cupreus* (Fowler and Bean): Type (U.S.N.M. No. 83108).

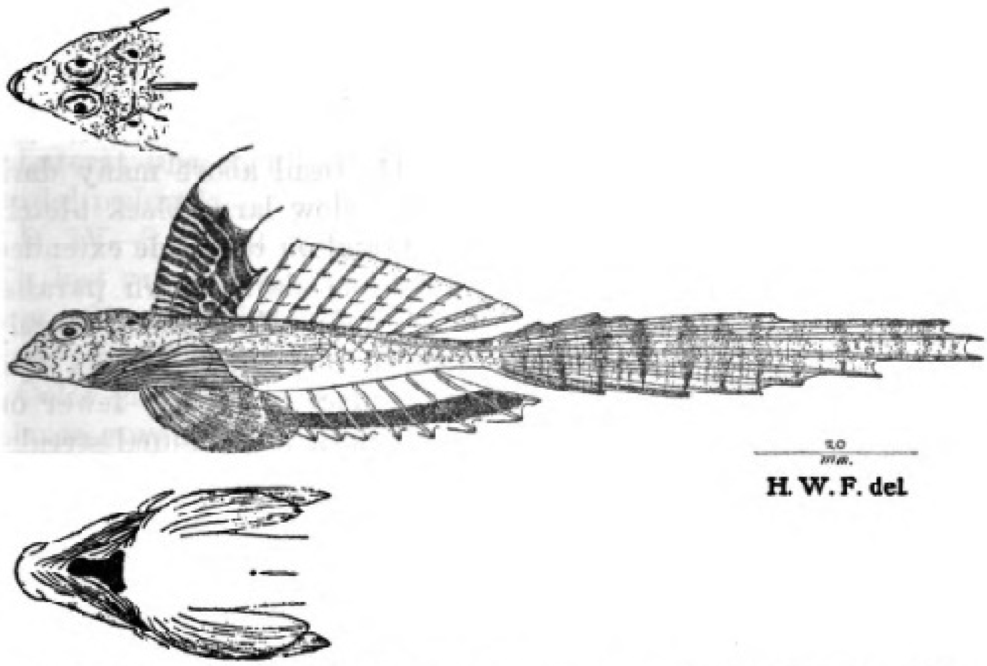


FIGURE 19.—*Calliurichthys linea-thorax*, new species: Type (U.S.N.M. No. 99504).

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Family CALLIONYMIDAE

Genus CALLIURICHTHYS Jordan and Fowler

CALLIURICHTHYS LINEA-THORAX, new species

FIGURE 19

Depth 6⅖; head 4, width 1. Snout 2¼ in head; eye 3⅔, 1¾ in snout; maxillary not quite reaching to eye, entire, length (in profile) 3 in head; orbit 2⅞, separated from its fellow only by narrow bony ridge; mouth cleft short, lower jaw very slightly shorter and included in upper jaw; lips narrow, smooth, entire; teeth fine, minute, villiform, in narrow bands in both jaws. Preopercular spine long as orbit, ends in backwardly directed point and along inner edge row of about a dozen very fine uniform denticles and small subbasal denticle in front pointing forward.

Lateral line complete, high along side of back, simple, connecting intersection on predorsal before first dorsal and two intersections rather closely set on caudal peduncle posteriorly a little before caudal base.

D. IV—9, I, first spine 2⅓ in fish without caudal, third spine 3½, first ray of second dorsal fin 1⅓ in head, last ray 1; A. 8, I, first ray 2¼, last ray 1⅒; least depth of caudal peduncle 4⅛; caudal fin nearly long as rest of fish; pectoral 3⅔ in fish without caudal, rays I, 18; ventral rays I, 5, fin length 3 in fish without caudal.

Color in alcohol light brown to pale mauve above, marked with very numerous and variable dark rings, arcs, and spots. About 10 rather large dark brown blotches along each side of back above. All under surfaces of body largely white. On head above many dark rings, closely set and variable. On head below large black blotch, more or less triangular on throat or chest, and on each side extended up on prepectoral region many or numerous dark brown parallel lines, separated by narrow pale to whitish lines. First dorsal largely blackish with numerous more or less longitudinal parallel white lines on first half of fin and fusing or giving place to greatly fewer on last half of fin. Second dorsal with four dark longitudinal streaks, most distinct or darker on fin rays. Anal pale, with broad blackish submarginal band. Caudal with 10 dark blotches on upper half of fin and broader intervals with dark circles and arcs; lower half of fin with edge of each ray terminally dark. Pectoral pale. Ventral whitish, with five transverse dark bars.

Known by its very distinctive coloration, the branchiostegal and prepectoral region with many parallel close-set longitudinal bands,

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separated on chest and throat by a large blackish triangular blotch. First dorsal with first and third spines ending in short filaments and fin crossed by numerous parallel white lines. The caudal long as rest of fish. Preopercular spine with seven antrorse spinules along its upper edge, besides the terminal point and subbasal spine directed forward. This species approaches *Calliurichthys japonicus* (Houttuyn) as described and figured by Jordan and Fowler, though differing markedly in its coloration of the thorax and first dorsal.

Apparently resembles *Calliurichthys gardineri* (Regan) [11] differing chiefly in coloration, especially the more lined thorax and throat.

Type.—U.S.N.M. No. 99504. D. 5174. Jolo Light, E. 2.60 miles (lat. 6°03′45″ N., long. 120°57′ E.), vicinity of Jolo. March 5, 1908. In 20 fathoms. No. 1813 [403]. Length 115 mm.

(*linea*, line + *thorax*.)

Genus SYNCHIROPUS Gill

SYNCHIROPUS DELANDI, new species

FIGURE 20

Depth 5⅓; head 3¼, wide as long. Snout 4⅛ (in profile) to gill opening; eye 3¾, exceeds snout, greater than interorbital; orbit 2½ in head; maxillary reaches below front of eye, length 3⅗ in head to gill opening, entire; mouth cleft reaches about ⅞ in snout, lower jaw little shorter than upper; teeth in villiform bands in jaws, none on palate; bony interorbital moderately narrow, width 1⅞ in eye, low; preopercle spine slightly less than eye, curved, ends in slender upcurved spine and rather large forward curved denticle on inner upper edge; no basal spinule in front.

Lateral line complete, high at first, falls median along side of caudal peduncle.

D. IV—8, I, first spine 1$\frac{1}{15}$ in head, first ray 1; A. 7, I, first ray 3⅞, last ray 1⅛; least depth of caudal peduncle 4⅛; pectoral 1$\frac{1}{15}$, rays I, 22; ventral rays I, 5, fin 3⅙ in fish without caudal; caudal 1⅘, lower rays longest.

Color in alcohol pale brown above, paler to whitish below. About 5 large gray brown blotches on back, mostly wider than paler interspaces and all more or less with rather large arcs or rings of darker. All along lower half of side of body parallel dark or gray bars. Head variegated with diffuse brown blotches above. First dorsal with five slightly darker brown blotches along first spine. Second dorsal pale, with two white longitudinal bands and upper anterior

[11] *Callionymus gardineri* Regan, Trans. Linn. Soc. London, ser. 2, vol. 12, p. 248, pl. 30, fig. 5, 1908 (type locality: Cargados Carajos, Indian Ocean).

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edge of fin narrowly black. Anal pale, with broad dark submarginal band. Caudal with five inclined, narrow, whitish bars along upper rays, hind edge of fin dark all around besides dark semitransverse basal band. Paired fins pale, dark blotch at upper base of pectoral.

Differs from *Synchiropus pallidus* in having the end of the preopercle spine upturned or vertical, the second dorsal with three horizontal white stripes and the female with a dark blotch on the third membrane of first dorsal.

Type.—U.S.N.M. No. 99524. D. 5589. Mabul Island (NW.), N. 3° W., 2.8 miles (lat. 4°12′10″ N., long. 118°38′08″ E.), Sibuko Bay, Borneo and vicinity. In 260 fathoms. September 29, 1909. No. 1959. Length 189 mm.

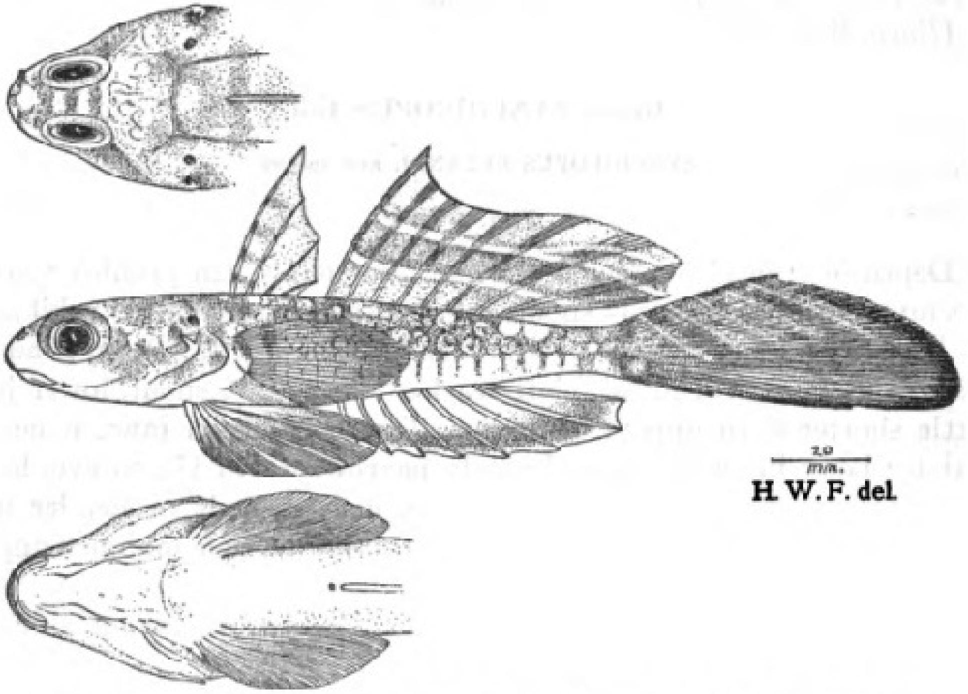


FIGURE 20.—*Synchiropus delandi*, new species: Type (U.S.N.M.No. 99524).

Paratypes.—U.S.N.M. No. 99525. D. 5516. Point Tagolo Light (Mindanao), S. 80° W., 9.7 miles (lat. 8°46′ N., long. 123°32′30″ E.), northern Mindanao and vicinity. In 175 fathoms. August 9, 1909. No. 1610. Length 148 mm.

U.S.N.M. No. 99526. D. 5518. Point Tagolo Light, S. 64° W., 8.7 miles (lat. 8°48′ N., long 123°31′ E.), northern Mindanao and vicinity. In 200 fathoms. August 9, 1909. No. 1960. Length 170 mm.

U.S.N.M. No. 99527. No data. No. 2511. Length 130 mm.

(Named for the late Dr. Judson de Land, of Philadelphia, to whom I am indebted for American fishes.)

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Family CHAMPSODONTIDAE

Genus CHAMPSODON Günther

CHAMPSODON CURTIPES, new species

FIGURE 21

Depth $4\frac{7}{8}$; head 3, width 2. Snout $3\frac{1}{2}$ in head measured from snout tip, which is level with middle of eye; eye $5\frac{3}{4}$, $1\frac{2}{3}$ in snout, $1\frac{1}{10}$ in interobital; maxillary reaches behind eye space about equal to $\frac{1}{3}$ of eye diameter, expansion $1\frac{1}{8}$ in eye, length $1\frac{1}{2}$ in head measured from snout tip; mouth well oblique, lower jaw well protruded in front and with conic point directed forward at symphysis; teeth in narrow band above, with inner larger row of fangs, depressible inward; two rows of teeth below, inner long fangs and depressible; cluster of few teeth, depressible, variable, each side of vomer; on top of head two bony keels forming wide set pair as prefrontal, frontal, parietal

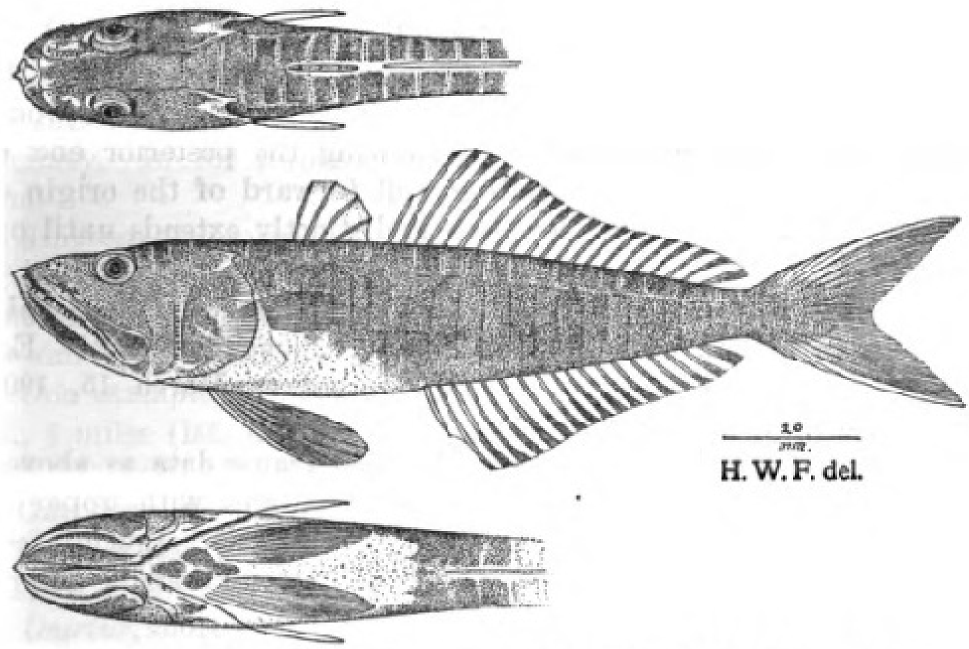


FIGURE 21.—*Champsodon curtipes*, new species: Type (U.S.N.M. No. 99506).

and occipital, last diverging to distinct suprascapular spine; edge of gill opening with elements of preopercle, subopercle, and interopercle forming marginal series of short equidistant denticles; preopercle with bent or crooked spine at angle, length $1\frac{1}{5}$ in eye and three forward-directed spines along its lower edge; preorbital with three divergent short spines, first directed forward, median downward and last backward; two short postocular ridges. Gill rakers 1+11, lanceolate, subequal with gill filaments or 2 in eye.

Scales all very small, irregular, closely set. On cranium, trunk, and tail transverse series of distinct lines of small scales, separated, about 30 such lines above, and on each side of body intersected by 2

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parallel well-spaced lateral lines. On head row of large scales close above and along upper edge of maxillary, besides vertical row on preopercle flange. Maxillary and side of mandible very minutely scaled. Belly and sides of abdomen naked and on breast four close-set finely scaly areas. Of fins only caudal basally covered with small scales.

D. IV—I, 20, I, second spine 3½ in total head length, second ray 2; A. 1, 17, I, spine 4¼, second ray 2⅗; least depth of caudal peduncle 5⅛; caudal 1½, deeply forked, lobes sharply pointed; pectoral 2⅘, rays 12; ventral rays I, 5, fin 1½, reaches 1⅐ to anal.

Color in alcohol brown above, paler to whitish below. Fins all pale or uniform brownish.

Apparently very closely related to *Champsodon arafurensis* Regan,[12] though that species would differ at once in having the "ventrals a little shorter than the head, extending to the origin of the anal," in specimens 50 to 75 mm. long. In all my specimens the ventrals fall well short of the anal in the larger ones and not even reaching opposite to them in the smallest. Regan has stated his *Champsodon arafurensis* "seems to be nearest to the one figured by Alcock [13] and may be the same." If this is true Alcock's figure would further differ from my material in showing the posterior end or tip of the preopercular spine falling well forward of the origin of the ventral fin. In all my specimens it distinctly extends until opposite it.

Type.—U.S.N.M. No. 99506. D. 5396. Panalangan Point, Talájit Island, S. 78° E., 4.5 miles (lat. 11°57′ N., long. 124°12′24″ E.), between Sámar and Masbate. In 137 fathoms. March 15, 1909. Length 133 mm. Female with ova.

Paratypes.—U.S.N.M. No. 99507. D. 5396 (same data as above). Length 58 to 130 mm. Sixteen specimens. Males with upper ⅔ of dorsal black and the fin uniformly pale in female. End of each caudal lobe dark brown, also upper border of second dorsal. Supraorbital cirrus present.

Additional specimens.—One example. D. 5557. Cabalían Point, N. 70° W., 5.2 miles (lat. 5°51′30″ N., long. 121°01′00″ E.), Jolo Island and vicinity. In 13 fathoms. September 18, 1909. Length 35 mm.

Two examples. D. 5193. Chocolate Island, N. 77° E., 8 miles (lat. 11°16′45″ N., long. 123°55′45″ E.), off northern Cebu Island, in 71 fathoms. April 3, 1908. Length 37 to 53 mm.

One example. D. 5098. Corregidor Light, N. 21° E., 4.30 miles (lat. 14°80′40″ N., long. 120°32′40″ E.), China Sea off southern Luzon. In 38 fathoms. January 2, 1908. Length 70 mm.

[12] Trans. Linn. Soc. London, ser. 2, vol. 12, pt. 2, p. 245, 1908 (type locality: Arafura Sea; Ki Islands; 129 fathoms).

[13] *Champsodon vorax* Alcock, Illustrations of the zoology of H. M. S. *Investigator*, Fishes, pl. 28, 1899.

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Seven examples. D. 5100. Corregidor Light, N. 16° E., 5.70 miles (lat. 14°17′15″ N., long. 120°32′40″ E.), China Sea off southern Luzon. In 35 fathoms. January 2, 1908. Length 61 to 78 mm.

Three examples. D. 5454. Legaspi Light, S. 64° W., 5.7 miles (lat. 13°12′ N., long. 123°50′30″ E.) east coast of Luzon. In 153 fathoms. June 7, 1909. Length 45 to 54 mm.

One example. D. 5183. Lusarán Light, S. 29° E., 4 miles (lat. 10°32′48″ N., long. 122°26′ E.), between Panay and Negros. In 96 fathoms. March 30, 1908. Length 38 mm.

One example. D. 5644. Makasser Island (E.), N. 4° E., 1.3 miles (lat. 5°27′24″ S., long. 122°38′00″ E.), Buton Strait, Dutch East Indies. In 22 fathoms. December 16, 1909. No. 22931. Length 60 mm.

One example. D. 5278. Malavatúan Island (N.), S. 23° E., 8.50 miles (lat. 14°00′10″ N., long. 120°17′15″ E.), China Sea vicinity of southern Luzon. In 102 fathoms. July 17, 1908. No. 10022. Length 58 mm.

Four examples. D. 5369. Tayabas Light (outer), No. 50° W., 8.8 miles (lat. 13°48′ N., long. 121°43′ E.), Marinduque Island and vicinity. In 106 fathoms. February 24, 1909. Length 56 to 104 mm.

Nineteen examples. D. 5376. Tayabas Light (outer), N. 53° W., 18.7 miles (lat. 13°42′50″ N., long. 121°51′30″ E.), Marinduque Island and vicinity. In 90 fathoms. March 2, 1909. Length 43 to 90 mm.

One example. D. 5391. Tobig Point (Destacada Island), N. 31° E., 3 miles (lat. 12°13′15″ N., long. 124°05′03″ E.), between Sámar and Masbate. In 118 fathoms. March 13, 1909. Length 36 mm.

One example. D. 5257. Utara Point, Bongo Island, N. 88° W., 7.70 miles (lat. 7°22′12″ N., long. 124°12′15″ E.), southern Mindanao, eastern Illana Bay. In 28 fathoms. May 22, 1908. Length 65 mm.

(*curtus*, short + *pes*, foot, with reference to the ventral fins.)

Family TRICHINOTIDAE

Subfamily KRAEMERINAE

GOBITRICHINOTUS, new genus

Type.—Gobitrichinotus radiocularis, new species.

Body elongate, slender, compressed, with tail little tapering. Head elongate, 1½ in trunk, attenuated, wider than deep at occiput. Snout short, depressed. Eye very small, near first fourth in head, closely set

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to one another and superior. Mouth large, superior. Maxillary extends below eye. Mandible large, well protruded forward, with fleshy end in front. Two pairs of nostrils anteriorly on snout. Interorbital very narrow. Gill opening very low, rather small. No scales. Myomeres distinct. Two dorsals. Origin of first dorsal opposite depressed pectoral and ventral tips, of five spines. Second dorsal origin midway between depressed pectoral tip and anal origin, which last little nearer gill opening than caudal base. Caudal small. Paired fins small, with ventral little larger than pectoral. Several dark lines radiate down and back from eye.

Related to *Kraemeria* Steindachner but differing chiefly in its greatly longer trunk which is but little shorter than the tail, longer pectoral, and more variegated coloration.

(*Gobius* + *Trichinotus*.)

GOBITRICHINOTUS RADIOCULARIS, new species

FIGURE 22

Depth 12¼; head 4⅕, width 2¾. Snout 4⅞ in head measured from snout tip; eye 4¾ in snout, slightly greater than interorbital, small and superior; maxillary oblique, extends down and little beyond eye, length 3¾ in head measured from snout tip; teeth minute, conic, simple, apparently uniserial in jaws; tongue with slender median notch in front; interorbital level. Gill opening extends forward not quite halfway in head.

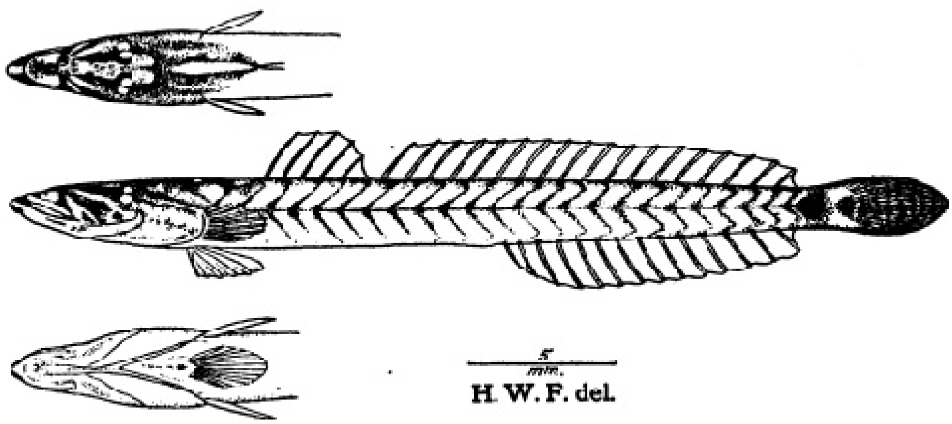


FIGURE 22.—*Gobitrichinotus radiocularis*, new species: Type (U.S.N.M. No. 99549).

Skin smooth, scaleless. Myomeres 11 + 13.

D. V—18, height of either fin less than greatest body depth and last ray like last anal ray connected with caudal peduncle by low membrane; A. I, 13, last ray opposite last dorsal ray; least depth of caudal

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peduncle 4¾ in total head length; pectoral 3, rays 9; ventral I, 5, fins joined, length 2½ in total head length.

Color in alcohol brown, limit of each myomere slightly darkened. On top of head dark bar down from eye to hind part of maxillary, and two others radiate back from hind part of each eye, expanding backward. Uppermost of each band in hind part of its expansion with two pale or whitish spots, one above the other and below and before median large pale occipital blotch. Dark diffuse shade on free part of caudal peduncle. Caudal with about six obscure transverse median dark parallel bars. Fins otherwise all uniformly pale.

Type.—U.S.N.M. No. 99549. Malabang River, southern Mindanao. Caught by hand. May 21, 1908. Length 32 mm.

Paratype.—U.S.N.M. No. 99550. Same data as type. Length 21 mm.

Characters largely in the generic account above.

(*radium*, ray + *ocularis*, of the eye, with reference to the markings.)

Family PTEROPSARIDAE

ROXASELLA, new genus

Type.—*Roxasella fusiforme*, new species.

Body subcylindrical, elongately ovoid in lateral contour, with long tapering tail. Caudal peduncle short, free, compressed. Head attenuated, depressed. Snout long, pointed, depressed. Eye small, superior, enters upper profile of head. Maxillary long, extends back well below eye. Mouth moderate, lower jaw the shorter. Teeth very small, in jaws and on palate.

Interorbital narrow bony frenum. Scales large, cycloid. Head largely scaled, muzzle naked. Lateral line present, complete, tubes large and simple. Two dorsals, well separated, first fin small with 13 graduated spines. Second dorsal long, little higher in front. Anal little longer than second dorsal, with notched edge. Caudal small, shorter than head. Pectoral moderate, reaches into front of anal. Ventrals small, widely set, inserted close behind preopercle.

Known chiefly by its small first dorsal, subequal jaws or the lower shorter, the small wide-set ventrals, and the large scales.

(Named for Hilario A. Roxas, in appreciation of his work in Philippine ichthyology.)

ROXASELLA FUSIFORME, new species

FIGURE 23

Depth 8½; head 3⅓, width 2⅕. Snout 3⅞ in head; eye 7⅓, 1⅞ in snout; maxillary reaches below hind eye edge, length 2⅗ in head; mouth little inclined from horizontal, lower jaw little shorter as

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closed; teeth minute, in narrow bands in jaws, above cluster each side in front followed by narrow band or line on each palatine; bony interorbital narrow frenum, its width $2\frac{1}{2}$ in eye. Gill opening ex-

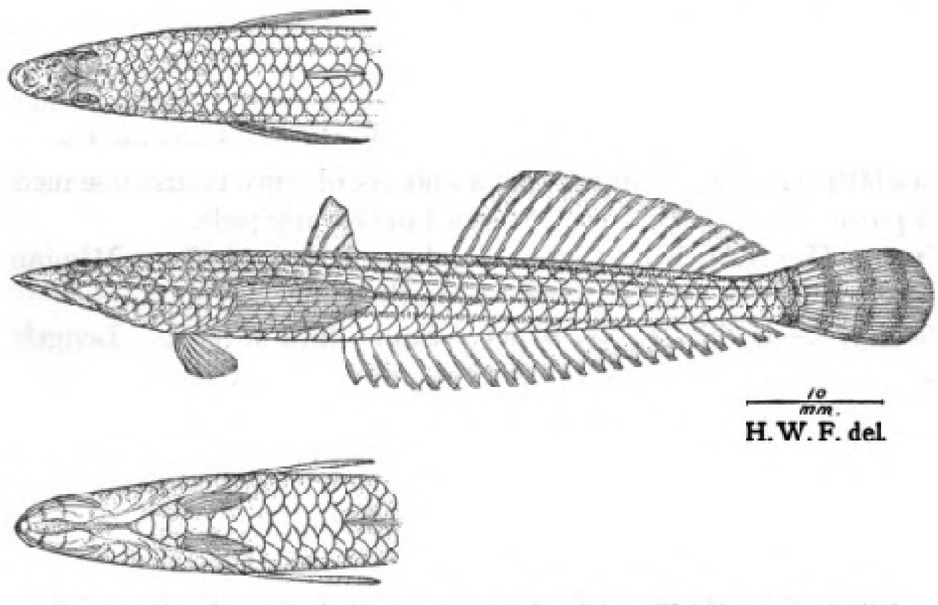


FIGURE 23.—*Roxasella fusiforme*, new species: Type (U.S.N.M. No. 99517).

tends forward halfway in head. Gill rakers not developed, merely as several groups of low minute asperities.

Scales 29+1 in lateral line; 2 above, 4 below, 15 predorsal forward to eyes; 9 postocular scales on head; row of 12 median scales before ventrals to isthmus. Head scaly, except muzzle and narrow median branchial space. Except for basal row of caudal scales fins scaleless. Lateral line axial along side of body.

D. III—16, first spine $3\frac{3}{5}$ in head, third ray $2\frac{1}{8}$, last ray $4\frac{1}{4}$; A. 24, first ray 5, seventh ray $3\frac{4}{5}$, last ray 6; least depth of caudal peduncle $5\frac{1}{5}$; caudal $1\frac{1}{2}$, hind edge convex; pectoral $1\frac{1}{2}$, rays 15; ventral I, 5, fin $3\frac{1}{3}$ in head.

Color in alcohol pale brown, above variegated with three dark longitudinal streaks on body as 2 above lateral line and 1 below. Also three longitudinal streaks on each side of head. Iris grayish. Fins pale. First dorsal with 2 or 3 brown spots on each spine. Second dorsal with same on each ray. Caudal with 4 dark transverse bands.

Distinctions embodied in the generic account above.

Type.—U.S.N.M. No. 99517. Aparri, Luzon. November 19, 1908. Length 63 mm.

Paratype.—U.S.N.M. No. 99518. Aparri, Luzon. November 19, 1908. Length 44 mm.

(*fusiformis*, fusiform or spindlelike.)

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Family ZOARCIDAE

Genus LYCENCHELYS Gill

LYCENCHELYS SPILOTUS, new species

FIGURE 24.

Depth 11 2/5; head 6, width 2 7/8. Snout 5 1/5 in head, convex, front end or tip falling slightly below level of lower eye edge; eye 3 4/7, greater than snout or interorbital, entering upper profile of head; mouth low, little inclined from horizontal and jaws even; maxillary reaches halfway in eye, length 3 in head; interorbital narrow, width 4 in eye, concave. Gill opening subvertical, length 3 1/6 in head.

Scales present only on trunk and tail, on front of back along base of dorsal fin and median strip on belly naked, also head. Fins scaleless.

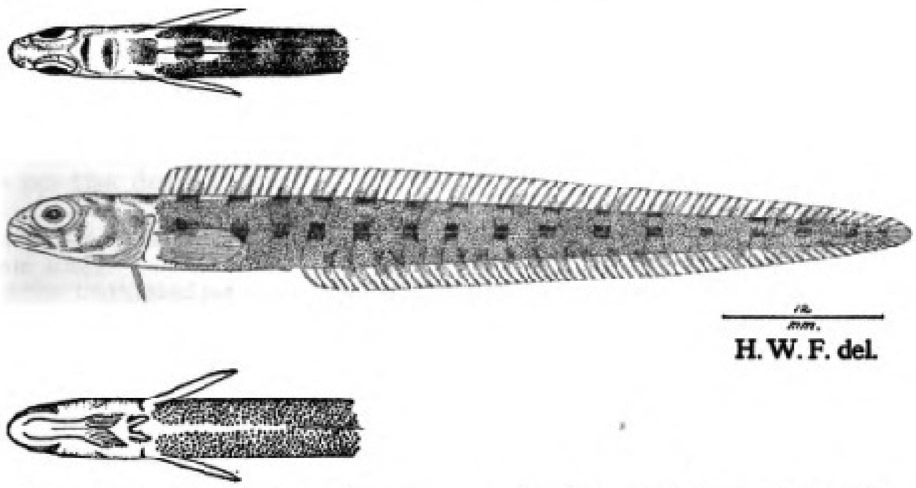


FIGURE 24.—*Lycenchelys spilotus*, new species: Type (U.S.N.M. No. 99511).

Dorsal rays about 70, fin height 4 1/8, fin origin close behind head or nearly over pectoral; anal rays about 64, fin height 4½; caudal length 5 2/3; pectoral 1 2/3, rays 17; ventral length 3 3/4.

Color in alcohol light brown, variegated with 16 dark brown quadrate blotches axially along side of body, each giving 2 dark lines above to dorsal base in interval opposite dark quadrate blotch dark bar; on tail each quadrate blotch gives off pair of dark vertical bars or blotches below which are reflected on base of anal fin. Dark blotch on predorsal close before dorsal origin. On head several dark bars on occiput, 1 on postocular, another from lower hind eye edge down over cheek. Two dark bars on opercle. Under surface of head and trunk whitish.

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Approaches *Lycenchelys poecilimon* Jordan and Fowler[14] appearing to differ in proportions, much smaller and shorter mouth, larger eye, apparently fewer dorsal and anal rays and the coloration.

Type.—U.S.N.M. No. 99511. D. 4817. Niigata Light, S. 29° E., 18 miles (lat. 38°12′ N., long. 138°52′ E.). In 61 fathoms. July 18, 1906. Length 70 mm.

(σπῖλωτός, spotted.)

Family MONACANTHIDAE

Genus STEPHANOLEPIS Gill

STEPHANOLEPIS RETROSPINIS, new species

FIGURE 25

Depth 1¾; head 3, width 2⅖. Snout 1⅓ in head, tip in front well below level of eye or opposite upper part of gill opening; eye 2⅘ in head, 2 in snout, slightly greater than interorbital; mouth small, terminal; teeth little exposed, front pair in each jaw largest; interorbital 3½ in head, convex. Gill opening 1⅔ in eye.

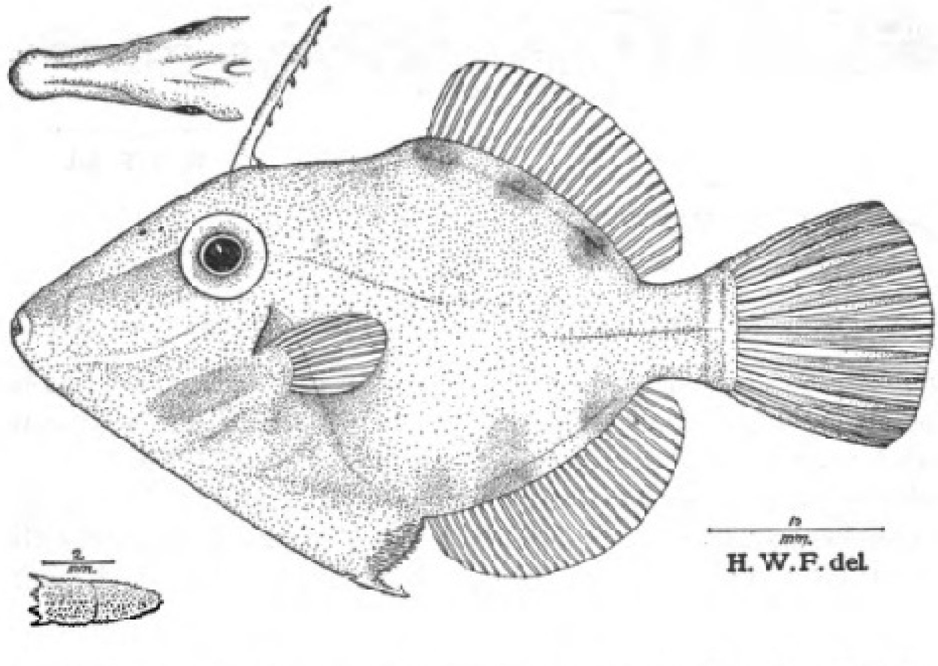


FIGURE 25.—*Stephanolepis retrospinis*, new species: Type (U.S.N.M. No. 108467).

Skin rough velvety. No armature on caudal peduncle or on side of tail. Pelvic flap little developed, with feeble slender spines. Pelvic spine hinged, hind section freely movable, edges spinescent all around.

[14] Proc. U. S. Nat. Mus., vol. 25, p. 748, fig. 2, 1903 (type locality: Off Kuikwazan in Matsushima Bay, Japan).

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D. I—25, spine 1¼ in head, reaches second dorsal when depressed, with row of 5 recurved large spinules each side and directed downward, second dorsal height 2⅗ in head; A. 28, fin height 4⅖; least depth of caudal peduncle 2⅗; caudal 1¼, convex behind; pectoral 2, rays 10.

Color in alcohol brown, little paler below eye and on under surface of body. On body below second dorsal base three diffuse dark gray blotches and 2 along base of anal. Iris gray white. Fins all pale to whitish.

Type.—U.S.N.M. No. 108467. Cebu Island, Philippines. April 24, 1929. Lt. H. C. Kellers. Length 51 mm.

Closely resembles *Stephanolepis cryptodon* as described by Herre[15] especially in its dorsal spine, which is said to have on either side of posterior part a row of six or eight feebly developed downward-pointing prickles. In my specimen they are not feeble and they are well developed denticles or spinules. Moreover the coloration is quite different from that shown in Bleeker's figure of *Paramonacanthus cryptodon*.[16]

(*retro*, turned back+*spina*, spine, with reference to the large denticles on the dorsal spine.)

[15] Philippine Journ. Sci., vol. 25, No. 4, p. 455, 1924 (Balayan Bay, Batangas; specimen 56 mm long).

[16] Atlas ichthyologique des Indes orientales Néerlandaises, vol. 5, p. 131, pl. (11) 225, fig. 1, 1865 (Celebes; Amboina; based on two specimens, 84 to 88 mm).

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VOLUME 14, PART 3

CONTRIBUTIONS TO THE BIOLOGY OF THE PHILIPPINE ARCHIPELAGO AND ADJACENT REGIONS

REPORT ON THE ECHINOIDEA COLLECTED BY THE UNITED STATES FISHERIES STEAMER "ALBATROSS" DURING THE PHILIPPINE EXPEDITION, 1907–1910. PART 3: THE ECHINONEIDAE, ECHINOLAMPADIDAE, CLYPEASTRIDAE, ARACHNOIDIDAE, LAGANIDAE, FIBULARIIDAE, URECHINIDAE, ECHINOCORYTHIDAE, PALAEOSTOMATIDAE, MICRASTERIDAE, PALAEOPNEUSTIDAE, HEMIASTERIDAE, AND SPATANGIDAE

By

THEODOR MORTENSEN

UNITED STATES

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REPORT ON THE ECHINOIDEA COLLECTED BY THE UNITED STATES FISHERIES STEAMER "ALBATROSS" DURING THE PHILIPPINE EXPEDITION, 1907–1910. PART 3: THE ECHINONEIDAE, ECHINOLAMPADIDAE, CLYPEASTRIDAE, ARACHNOIDIDAE, LAGANIDAE, FIBULARIIDAE, URECHINIDAE, ECHINOCORYTHIDAE, PALAEOSTOMATIDAE, MICRASTERIDAE, PALAEOPNEUSTIDAE, HEMIASTERIDAE, AND SPATANGIDAE

By Theodor Mortensen

In presenting the third and final part of the report on the echinoids collected by the *Albatross* Philippine Expedition I want to thank again the authorities of the United States Fish and Wildlife Service and of the United States National Museum for the privilege of working up this important and interesting collection. Special thanks are due to Austin H. Clark, curator of echinoderms of the National Museum, for his encouragement and help, and above all to Dr. Alexander Wetmore, Secretary of the Smithsonian Institution, for permitting me to include the illustrations and the more detailed descriptions of the various new forms collected by the *Albatross* (apart from the cidarids) in my Monograph of the Echinoidea; from a scientific point of view it is a great advantage thus to have all the illustrations in one place. Further, I extend my deep gratitude for permission to study the *Albatross* collection in combination with the prosecution of the work on my monograph, for this has been a great advantage—much better than identifying the various forms simply on the basis of the already existing literature. On the other hand, it has caused considerable delay in the publication of the *Albatross* report. I am indeed grateful that I have had no word of complaint of the long time it has taken me to finish this report.

Foremost in interest among all the echinoids collected by the *Albatross* Philippine Expedition stands the discovery of a Recent representative of the family Micrasteridae, hitherto known only as fossils, namely *Isopatagus obovatus*. This find vies in importance with the discovery by the *Siboga* Expedition of a Recent echinocorythid, *Stereopneustes relictus*. Very noteworthy also is the discovery of a

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species of *Conolampas* in the Philippine seas, the genus *Conolampas*, hitherto known to occur only in the West Indies. (The fact that I took another species of *Conolampas* at the Kei Islands in 1922 and that the Murray Expedition took a third species in the Indian Ocean gives quite a new conception of this fine echinolampadid and its geographical distribution.) Of considerable interest is likewise the discovery of a fine new *Pericosmus*, *P. melanostomus*. This genus was hitherto thought to be extinct, until the *Investigator* discovered a species, *P. macronesius* Koehler, in the Indian Ocean; but the discovery of this new species, together with Crossland's find of a fine large species, *Pericosmus akabanus* Mortensen, in the Red Sea and my own discovery of several more species (to be described in volume 5 of my Monograph of the Echinoidea), proves this genus to be still living in full vigor.

A notable fact is the strong development of the genus *Brissopsis* in the Philippine seas, no less than five species being taken by the *Albatross*, which means that six species occur there, one of them, the very common *Brissopsis luzonica*, having curiously enough not been taken at the Philippines by the *Albatross*. The absence of such interesting forms as *Aëropsis*, *Aceste*, and *Pourtalesia* is regrettable, but this is balanced by the presence of several specimens of a new *Plesiozonus* (though in a very poor condition).

On the whole this collection of echinoids from the Philippine seas is very rich and compares favorably with the collection of the *Siboga* Expedition. These two expeditions, combined with my own researches at the Kei Islands (1922) and in the Bali Sea (1928), have given the proof that the Malay Region, of which the Philippines form an integral part, is, together with the Japanese seas, particularly the Sagami Sea, the richest in the world in echinoids (and apparently also in the other classes of echinoderms), as were the then European seas in Jurassic and Cretaceous times.

Order HOLECTYPOIDA

Family ECHINONEIDAE

Genus ECHINONEUS Leske

ECHINONEUS CYCLOSTOMUS Leske

Echinoneus cyclostomus A. Agassiz, Revision of the Echini [Mem. Mus. Comp. Zool., vol. 3], pp. 117, 550, pl. 14, figs. 6–8; pl. 14a, figs. 5–10, 1873.—Westergren, Mem. Mus. Comp. Zool, vol. 39, No. 2, p. 44, 1911.—H. L. Clark, Hawaiian and other Pacific Echini: Echinoneidae . . . Spatangidae, p. 147, 1917: Catalogue of the Recent sea-urchins in the British Museum, p. 177, 1925.

Locality.—Station 5143; off Joló Light (lat. 6°05′50″ N., long. 121°02′15″ E.); 35 meters; February 15, 1908. One small dead test.

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Order CASSIDULOIDA

Family ECHINOLAMPADIDAE

Genus ECHINOLAMPAS Gray

ECHINOLAMPAS ALEXANDRI de Loriol

Echinolampas alexandri DE LORIOL, Mém. Soc. Hist. Nat. Genève, vol. 24, p. 4, pl. 1, figs. 1–3, 1876.—H. L. CLARK, Hawaiian and other Pacific Echini: Echinoneidae . . . Spatangidae, p. 114, pl. 144, figs. 14–16; pl. 153, figs. 3, 4, 1917.—KOEHLER, Echinoderma of the Indian Museum, Echinoidea, pt. 2, p. 144, pl. 4, fig. 10, 1922.—H. L. CLARK, Catalogue of the Recent sea-urchins in the British Museum, p. 182, 1925.

Remarks.—A single old, broken test, unfortunately without label, must, I think, be referred to *E. alexandri*, the characters of the petals, the coarse tuberculation, the broad transverse peristome, and the quite rudimentary floscelle conforming with this species. It would seem, then, that this species occurs also in the Malay region, though it has not till now been recorded from there. (The *Echinolampas depressa* recorded by de Meijere in his *Siboga* Echinoidea, p. 144, from off Saleyer is not that species but a close relative of *Echinolampas alexandri*, a fact that has been mentioned in volume 4, part 1, of my Monograph of the Echinoidea.)

Genus CONOLAMPAS A. Agassiz

CONOLAMPAS DIOMEDEAE, new species

Locality.—Station 5261, off Mindoro (lat. 12°30′55″ N., long. 121°34′24″ E.); 265 meters; June 4, 1908. One specimen.

Type.—U.S.N.M. No. E.7147, from station 5261.

Description.—The test is perfectly hemispherical, the apex being in the center; the oral side is perfectly flat, scarcely at all sunken in the middle and without any tumidity before the periproct. The outline is almost circular, only slightly ovoid, 70 mm. long, 66 mm. broad, the elongation hardly perceptible. The height is 33 mm., exactly half the breadth.

The mouth is slightly posterior, 36 mm. from the anterior, 34 mm. from the posterior edge of the test, measured from the center of the mouth; it is rather small, 8 mm. wide. Periproct a little smaller, 7 mm. wide, situated distinctly on the oral side. Apical system of the shape usual in *Echinolampas;* it is slightly knob-shaped, placed almost exactly in the center.

Ambulacra: The aboral poriferous areas, which are not at all petaloid, reach very nearly to the edge of the test. The anterior ambulacrum has 62 or 63 pore-pairs in both series; ambulacrum (II and) IV has 68 pore-pairs in the anterior, 72 in the posterior series,

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and ambulacrum (I and) V has 71 pore-pairs in the anterior, 60 in the posterior series. There are 3–5 small tubercles on the ridge between the consecutive pore-pairs, forming a more or less regular transverse series. The outer pore is twice as broad as the inner and is connected with the latter by a short, not very deep furrow. The interporiferous zone has in the upper part only two, lower down three or four, larger tubercles in a transverse series. The ambulacra are about 7 mm. broad at the widest, distal part; they continue of the same width to the ambitus and on the oral side, narrowing slightly adorally. The phyllode is well developed, but not widened, with the three series of pores (tube feet) more or less regularly developed. The bourrelets are not very prominent. The tubercles of the interambulacra are of the same size as those of the ambulacra. The tuberculation of the oral side is rather dense. Glassy tubercles are less developed than in *C. sigsbei* and confined to the aboral side. The pedicellariae are not specifically characteristic. The spines, of the character usual in *Echinolampas*, afford no specific features. The color of the spines is yellowish, the denuded test whitish.

On account of the shape of the test this species must be referred to the genus *Conolampas*. From the only species of this genus hitherto made known, the West Indian *Conolampas sigsbei* A. Agassiz, it is very well distinguished by the much lower and correspondingly more numerous ambulacral plates and by the pores being unequal, the outer pore much larger than the inner one (in *C. sigsbei* they are of equal size); also the phyllodes and bourrelets are less developed than in *C. sigsbei;* on the other hand, the tuberculation of the oral side is much denser than in *C. sigsbei*. It is much more closely related to another species of *Conolampas* than it is to the West Indian species. The former was collected by the John Murray Expedition in the Indian Ocean, off the Maldive Islands, and is described in my Report on the Echinoids of that Expedition, part 2, under the name *Conolampas murrayana* Mortensen. *C. diomedeae* is distinguished from that species mainly by the petals being somewhat longer and narrower and by the denser tuberculation of the oral side.

Order CLYPEASTROIDA

Family CLYPEASTRIDAE

Genus CLYPEASTER Lamarck

CLYPEASTER (STOLONOCLYPUS)[1] HUMILIS (Leske)

Clypeaster humilis A. Agassiz, Revision of the Echini, pp. 100, 510, 1873.—H. L. Clark, Hawaiian and other Pacific Echini: Clypeastridae . . . Scutellidae,

[1] Concerning the subgenera of *Clypeaster* reference must be made to the forthcoming volume 4, part 2, of my Monograph of the Echinoidea.

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p. 36, pl. 123, fig. 23; pl. 137; pl. 138, fig. 4, 1914.—KOEHLER, Echinoderma of the Indian Museum, Echinoidea, pt. 2, p. 51, pl. 3, figs. 1–5, 12; pl. 14, fig. 5, 1922.—H. L. CLARK, Catalogue of the Recent sea-urchins in the British Museum, p. 149, 1925.

Clypeaster rosaceus DE MEIJERE, *Siboga* Echinoidea, p. 133, pl. 18, figs. 352, 353, 1904.

Locality.—Station 5160, Tinakta Island (lat. 5°12′40″ N., long. 119°55′ E.); 22 meters; February 22, 1908. One specimen.

Remarks.—This is a fine specimen, 68 mm. long, of nearly oval outline. The petaloid area is only half the test length, the anterior petal slightly open. It is, on the whole, a fairly typical example of this rather variable species.

It is generally agreed that it was a very regrettable mistake by Lovén (whom de Meijere follows) to use the name *rosaceus* of Linnaeus for this specits. The name *rosaceus* is to be used for the common West Indian species, the genotype of the genus *Clypeaster*.

CLYPEASTER (STOLONOCLYPUS) VIRESCENS Döderlein

Clypeaster virescens DÖDERLEIN, Arch. für Naturg., vol. 51, p. 30, 1885.—H. L. CLARK, Hawaiian and other Pacific Echini: Clypeastridae . . . Scutellidae, p. 39, pl. 122, fig. 15; pl. 123, figs. 28–31; pl. 128, fig. 8; pl. 139, fig. 4; pl. 140, figs. 1, 2, 1914; Catalogue of the Recent sea-urchins in the British Museum, p 153, 1925.

Locality.—Station 5415, between Cebu and Bohol (lat. 10°08′ N., long. 123°57′ E.); 160 meters; March 24, 1909. One specimen.

Remarks.—The specimen is a large one, 135 mm. long, and very badly broken. I have succeeded in gluing the larger fragments together, so that one gets an idea of what it looked like when alive. The distal part of the test rises fairly gradually toward the petaloid region, from where it rises more steeply. I have specimens of similar shape from the Kei Islands, together with such as have the edge flatter, as is the rule in the Japanese specimens. I have no doubt that this specimen actually belongs to *C. virescens*, so widely distributed in the Pacific, from Japan to New Zealand.

The tridentate pedicellariae have slender valves, as I find them in a specimen from off New South Wales. (These will be figured in volume 4, pt. 2, of the Monograph of the Echinoidea.)

CLYPEASTER (RHAPHIDOCLYPUS) RETICULATUS (Linnaeus)

Clypeaster scutiformis A. AGASSIZ, Revision of the Echini, pp. 101, 512, pl. 13, figs. 1–4, 1873.—DE MEIJERE, *Siboga* Echinoidea, p. 131, pl. 18, figs. 344–351, 1904.

Clypeaster reticulatus H. L. CLARK, Hawaiian and other Pacific Echini: Clypeastridae . . . Scutellidae, p. 34, pl. 124, figs. 3–6, 1914.—KOEHLER, Echinoderma of the Indian Museum, Echinoidea, pt. 2, p. 63, pl. 6, figs. 3, 4; pl. 15, fig. 10, 1922.—H. L. CLARK, Catalogue of the Recent sea-urchins in the British Museum, p. 151, 1925.

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Localities.—Station 5159, Tinakta Island, Tawi Tawi Group (lat. 5°12′ N., long. 119°54′ E.); 18 meters; February 21, 1908. Two specimens.

Station 5160, Tinakta Island (lat. 5°12′40″ N., long. 119°55′ E.); 22 meters; February 22, 1908. One specimen.

Station 5218, between Burias and Luzón (lat. 13°11′15″ N., long. 123°02′45″ E.); 37 meters; April 22, 1908. One young specimen.

Remarks.—These specimens are all of the relatively flat type, with the edge only moderately thick (5.5 mm. in the largest specimen); it will be dealt with more in detail in the forthcoming volume 4, pt. 2, of my Monograph of the Echinoidea. The specimen from station 5218 is a small one, 15.5 mm. long, but has the genital pores fully developed; it has the aboral side of the test distinctly sculptured, as is characteristic of young specimens of this species. It is of a uniform yellowish color, as is also the specimen from station 5160, while the two somewhat larger specimens from station 5159 (30 and 38 mm. long, respectively) show traces of the reddish marginal spots commonly found in this species.

CLYPEASTER (RHAPHIDOCLYPUS) FERVENS Koehler

Clypeaster fervens KOEHLER, Echinoderma of the Indian Museum, Echinoidea, pt. 2, p. 45, pl. 6, figs. 1, 2, 6; pl. 13, fig. 6; pl. 15, fig. 1, 1922.

Locality.—Station 5640, Buton Strait (lat. 4°27′ S., 122°55′40″ E.); 45 meters; December 13, 1909. One specimen.

Remarks.—The single specimen is a dead test, 67 mm. long, 57 mm. broad, 14 mm. high. The petaloid area is 38 mm., thus somewhat more than half the test length. The edge of the test is about 6 mm. thick, or about one-tenth of the test length.

In the outline of the test this specimen agrees with *Clypeaster fervens*, particularly with the specimens collected by the Murray Expedition. The markedly concave oral side is as typical of *fervens*. The specimen, however, differs from *fervens* in one character—the somewhat narrower petals. Whether this means that it is specifically different from the typical *fervens* is impossible to tell with only a single naked test at hand. For the present, at least, I cannot hesitate in referring this specimen to *C. fervens*, otherwise known only from the Indian Ocean.

CLYPEASTER (LEPTOCLYPUS) ANNANDALEI Koehler

Clypeaster annandalei KOEHLER, Echinoderma of the Indian Museum, Echinoidea, pt. 2, p. 16, pl. 1, figs. 1–7; pl. 2, figs. 1–11; pl. 3, figs. 6–9; pl. 5, fig. 3; pl. 10, fig. 7; pl. 14, fig. 1, 1922.

Locality.—Station 5381, Ragay Gulf, Luzón (lat. 13°14′15″ N., long. 122°44′45″ E.); 160 meters; March 6, 1909. Three specimens.

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Remarks.—The specimens are 51–65 mm. long; they are quite typical *annandalei*.

As this species was hitherto known only from the Indian Ocean, mainly the western part, it is of considerable zoogeographical interest that it is here shown to occur also in the Philippines, which implies that it must be more widely distributed in the Malay region.

CLYPEASTER (CORONANTHUS) PATERIFORMIS, new species

Station 5276, Malavatuan Island, Luzón (lat. 13°49′ N., long. 120°15′ E.); 33 meters; July 17, 1908. One specimen.

Type.—U.S.N.M. No. E.7148, from station 5276.

Description.—Test almost circular, 70 mm. long, 69 mm. wide; only between the paired petals the edge is nearly straight. It is very low, height only about 9 mm. The oral side is markedly concave, the shape of the test recalling, indeed, a sacrificial dish (*patera*) as expressed in the species name.

The petals are very short, the whole petaloid area only 28 mm., or much less than half the test length. The frontal petal is slightly the longest. The petals are leaf-shaped, broad adapically, pointed and closed distally. The ridges between the pore-pairs carry 4–7 primary spines (tubercles).

The primary spines of the oral side are about 3 mm. long, not or only slightly widened distally; the marginal spines form a distinct fringe. The spines around the peristome are not curved or widened. The aboral primaries are 1 mm. long, not club-shaped. Miliary spines not peculiar. The apical system is central; the genital pores are covered by fairly large genital papillae. The periproct is small, 2 mm. in diameter, covered with small spines as usual in *Clypeaster*; it is 7 mm. distant from the edge of the test. The peristome is small, transverse-oval; it is hardly at all sunken.

The tridentate pedicellariae have very slender valves, which meet only distally where they are widened and deeply serrate. The ophicephalous pedicellariae have a rather long narrow basal part, without a circle of thorns. Triphyllous pedicellariae not peculiar. The sucking disk of the tube feet is well developed.

The color is a uniform brownish.

Remarks.—This species appears to be the nearest related to *Clypeaster telurus*, with which it agrees in the important character of the great distance between the periproct and the edge of the test. It differs, however, from *telurus* by its round outline, the not club-shaped aboral primary spines, the smaller petaloid area, and the different shape of the tridentate and ophicephalous pedicellariae. There can be no doubt of its specific distinctness.

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Family ARACHNOIDIDAE

Genus ARACHNOIDES Leske

ARACHNOIDES PLACENTA (Linnaeus)

Arachnoides placenta A. Agassiz, Revision of the Echini, p. 530, 1873 (*pro parte; non* pl. 13b, figs. 1–4=*A. zelandiae* Gray).—H. L. Clark, Hawaiian and other Pacific Echini, Clypeastridae . . . Scutellidae, p. 43, 1914 (*pro parte; non* pl. 125, figs. 1–3=*A. zelandiae*); Catalogue of the Recent sea-urchins in the British Museum, p. 154, 1925.

Only a single broken test of this species was collected by the *Albatross*, at Verde del Sur Island, Palawan, probably on the beach.

Family LAGANIDAE

Genus PERONELLA Gray

PERONELLA LESUEURI (Valenciennes)

Laganum lesueuri L. Agassiz, Monographie des scutelles, p. 116, pl. 24, figs. 3–6, 1841.—de Meijere, *Siboga* Echinoidea, p. 122, pl. 6, figs. 63, 67, 70; pl. 18, figs. 329–333, 1904.

Laganum rostratum L. Agassiz, Monographie des scutelles, p. 118, pl. 25, 1841.

Peronella decagonalis A. Agassiz, Revision of the Echini, pp. 148, 520, pl. 13e, figs. 8–11, 1873.

Peronella rostrata A. Agassiz, Revision of the Echini, pp. 149, 523, 1873.

Peronella lesueuri H. L. Clark, Hawaiian and other Pacific Echini, Clypeastridae . . . Scutellidae, p. 53, pl. 124, figs. 23, 24, 1914; Catalogue of the Recent sea-urchins in the British Museum, p. 159, 1925; Mem. Mus. Comp. Zool., vol. 55, p. 417, pl. 15, fig. 5, 1938.

Localities.—Station 5161, Tinakta Island (lat. 5°10′ N., long. 119°53′ E.); 29 meters; February 22, 1908. Six dead tests.

Station 5181, off eastern Panay (lat. 11°37′ N., long. 123°27′ E.); 48 meters; March 27, 1908. Ten specimens, seven of which are dead tests.

Station 5276, China Sea, off Luzón (lat. 13°49′ N., long 120°15′ E.); 33 meters; July 17, 1908. Four specimens.

Remarks.—The specimens from stations 5161 and 5181 are of the variety *rostrata* (A. Agassiz).

I agree with de Meijere and Clark that the *Laganum rostratum* of L. Agassiz cannot be maintained as distinct from his *L. lesueuri;* still, the slightly prominent posterior end of the test gives so characteristic a general appearance that there is good reason for recognizing this form as a separate variety.

The largest of the specimens of the variety, a dead test, is 45 mm. long, much smaller than the type, which is 85 mm. long.

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The localities New Zealand and Zanzibar, given by L. Agassiz for his *Laganum rostratum*, are evidently due to erroneous labels. The variety is till now known only from the Malay region.

From the shore at Capunuypugan Point (east coast of Mindanao), May 9, 1908, there is a single specimen, 56 mm. long, which has much the appearance of *Peronella lesueuri*, but the periproct is situated more inward than usual in that species, and, what is more important, the madreporic pores are placed in irregular furrows as in *Laganum;* there are only three genital pores. Also the outline is irregular. It is quite evident that this is an abnormal specimen, and I think it must be a hybrid of *Peronella lesueuri* and a *Laganum*, perhaps *L. depressum*. It is regrettable that only this specimen was taken; had a fair number of laganids been collected at this locality, it would probably have been possible to arrive at a more definite conclusion as to the affinities of this specimen.

PERONELLA (?) PELLUCIDA Döderlein

Peronella (Laganum) pellucida DÖDERLEIN, Arch. für. Naturg., vol. 51, p. 32, 1885.
Peronella pellucida H. L. CLARK, Hawaiian and other Pacific Echini, Clypeastridae . . . Scutellidae, p. 53, pl. 142, figs. 1, 8–10, 1914.

Locality.—Station 5156, Tinakta Island (lat. 5°13′ N., long. 119°56′ E.); 33 meters; February 21, 1908. One naked but otherwise well-preserved test.

Remarks.—This specimen I refer with some little doubt to the Japanese *Peronella pellucida*. It agrees with that species in its general shape, in the characters of the petals, and in the almost central position of the periproct, which is also naked as in *pellucida*. But it is somewhat lower than usual for *pellucida* and the periproct is triangular, with the point inward, not round as otherwise in *pellucida;* further it has the genital pores developed at a length of 24 mm., while in specimens from Japan the genital pores are only about to appear at a length of 27 mm.

It is, of course, quite possible that these characters come within the range of variation of *Peronella pellucida;* but with the material available at present this cannot be ascertained definitely. From a zoogeographical point of view there can be no objection to referring this specimen to *Peronella pellucida;* it is true, the species has till now been recorded only from Japanese seas, but I have some tests (unfortunately dead) from the Kei Islands, which almost certainly belong to *P. pellucida*, so that this species may be expected to occur all over the Malay region. On the other hand, the small depth, 33 meters, at which this specimen was taken is unusual for *P. pellucida*, which is otherwise more of a deep-sea form, hitherto not known from less than 77 meters. After all, then, I think it the best course to refer this specimen provisionally and with reservation to *Peronella pellucida*.

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PERONELLA ORBICULARIS (Leske)

Laganum orbiculare L. AGASSIZ, Monographie des scutelles, p. 120, pl. 22, figs. 16–20, 1841.—DE MEIJERE, *Siboga* Echinoidea, p. 126, pl. 6, figs. 69, 73–75; pl. 18, figs. 335–339, 1904.

Peronella orbicularis, A. AGASSIZ, Revision of the Echini, pp. 149, 521, 1873.—H. L. CLARK, Hawaiian and other Pacific Echini, Clypeastridae . . . Scutellidae, p. 52, 1914; Catalogue of the Recent sea-urchins in the British Museum, p. 160, 1925.

Localities.—Station 5164 (lat. 5°02′ N., long. 119°52′ E.); 33 meters; February 24, 1908. One dead broken test.

Station 5181, off eastern Panay (lat. 11°37′ N., long. 123°27′ E.); 48 meters; March 27, 1908. Five dead partly broken tests.

Station 5432 (lat. 10°38′ N., long. 120°12′ E.); 93 meters; April 8, 1909. One dead broken test.

Remarks.—Although all these specimens are dead tests, partly rather badly broken, they appear to be referable to the species *orbicularis*, so that I have no doubt about the identification. The specimens from station 5181 are clearly of the variety *concava*, which I have established for some specimens from the Kei Islands (*cf.* my Monograph of the Echinoidea, vol. 4, part 2). The other specimens are in too poor condition for deciding whether they belong to the variety or the typical form.

PERONELLA MACROPROCTES Koehler

Peronella macroproctes KOEHLER, Echinoderma of the Indian Museum, Echinoidea, pt. 2, p. 113, pl. 9, figs. 5, 11, 14; pl. 10, figs. 10–12; pl. 15, fig. 11, 1922.

Localities.—Station 5218, between Burias and Luzón (lat. 13°11′ N., long. 123°03′ E.); 37 meters; April 22, 1908. One specimen.

Station 5356, North Balabac Strait (lat. 8°06′40″ N., long. 117°18′45″ E.); 106 meters; January 5, 1909. One specimen.

Remarks.—I have no doubt about identifying these specimens with the *P. macroproctes* Koehler, hitherto known only from the south coast of Ceylon (*Investigator*); I have, however, collected a good number of specimens at the Kei Islands, and new information about this species will be given in volume 4, part 2, of my Monograph of the Echinoidea. The specimen from station 5218 is 29 mm. long and one of the largest specimens known. The peculiar broad-valved tridentate pedicellariae are well developed in this specimen.

PERONELLA MINUTA (de Meijere)

Laganum minutum DE MEIJERE, *Siboga* Echinoidea, p. 125, pl. 6, figs. 76, 77; pl. 18, fig. 334, 1904.

Peronella minuta H. L. CLARK, Hawaiian and other Pacific Echini, Clypeastridae . . . Scutellidae, p. 51, 1914.

Localities.—Station 5149, Sulu Archipelago (lat. 5°33′ N., long. 120°42′10″ E.); 18 meters; February 18, 1908. One dead test.

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Station 5165, Sulu Archipelago (lat. 4°58′20″ N., long. 119°50′30″ E.); 16 meters; February 24, 1908. One specimen in good condition.

Remarks.—These specimens are quite typical representatives of this well-marked species, which is known only from the Sulu Archipelago.

Genus LAGANUM Gray

LAGANUM LAGANUM (Leske)

Laganum bonani L. Agassiz, Monographie des scutelles, p. 108, pl. 22, figs. 25–29; pl. 23, figs. 8–12, 1841.—A. Agassiz, Revision of the Echini, p. 517, pl. 13e, figs. 6, 7, 1873.—Koehler, Echinoderma of the Indian Museum, Echinoidea, pt. 2, p. 83, pl. 9, fig. 4; pl. 14, fig. 6, 1922.

Laganum laganum H. L. Clark, Hawaiian and other Pacific Echini, Clypeastridae . . . Scutellidae, p. 45, pl. 124, fig. 17, 1914.

Localities.—Port Argo; January 31, 1908. Three dead tests.

Bubuán Island, Joló; February 14, 1908. One dead test.

Tataán, Simaluc Islands, shore; February 19, 1908. Several fine specimens.

Station 5166, Observation Island, Tawi Tawi Group; 97 fathoms; February 24, 1908. One dead test.

Sitanki Island; February 26, 1908. One dead test.

Romblón, shore; March 26, 1908. Several specimens.

Reef opposite Cebu; April 4, 1908. One specimen.

Catbalogan, Sámar; April 15, 1908. One specimen.

Busin Harbor, Burias Island; April 23, 1908. One specimen.

Capunuypugan, Mindanao; May 9, 1908. One specimen.

Malcochin Harbor, Linapacan Island; December 19, 1908. One specimen.

Ulugan Bay, Palawan Island; December 28, 1908. One specimen.

Remarks.—There can be no doubt that the dead specimen from station 5166 at 97 fathoms has not been living there, as this species is preeminently a littoral form. Although de Meijere, in his *Siboga* Echinoidea, records a specimen from a depth of 34 meters (station 299), he does not say whether it was a living specimen or a dead test; there is then no proof of the occurrence of this species outside the strictly littoral zone.

The specimens from Catbalogan and Malcochin Harbor are unusually broad, as broad as long (36 and 23 mm. long, respectively), but otherwise seem to be the typical form. I must regard them as only individual variations.

LAGANUM DECAGONALE (de Blainville)

Laganum decagonum L. Agassiz, Monographie des scutelles, p. 112, pl. 23, figs. 16–20, 1841.

Laganum (Peronella) decagonale de Meijere, *Siboga* Echinoidea, p. 117, pl. 6, figs. 58–62, 65; pl. 18, figs. 318–324, 1904.

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Laganum decagonale H. L. CLARK, Hawaiian and other Pacific Echini, Clypeastridae . . . Scutellidae, p. 46, 1914.—KOEHLER, Echinoderma of the Indian Museum, Echinoidea, pt. 2, p. 85, pl. 8, fig. 5; pl. 11, fig. 3; pl. 15, fig. 13, 1922.—H. L. CLARK, Catalogue of Recent sea-urchins in the British Museum, p. 156, 1925.

Localities.—Station 5103, off southern Luzón (lat. 14°50′ N., long. 120°14′ E.); 37 meters; January 7, 1908. Ten specimens.

Station 5104, off southern Luzón (lat. 14°46′ N., long. 120°12′ E.); 60 meters; January 8, 1908. Four specimens, one of them a dead test.

Station 5181, off eastern Panay (lat. 11°37′ N., long. 123°27′ E.); 48 meters; March 27, 1908. Ten dead tests, one live specimen.

Station 5206, off western Sámar (lat. 11°32′ N., long. 124°43′ E.); 59 meters; April 14, 1908. Several dead tests and six live, mostly small specimens.

Station 5207, off western Sámar (lat. 11°38′ N., long. 124°41′ E.); 64 meters; April 14, 1908. Several mostly small specimens, many of them dead tests.

Station 5208, off western Sámar (lat. 11°46′ N., long. 124°43′ E.); 48 meters; April 14, 1908. Nine specimens.

Station 5210, off western Sámar (lat. 11°50′ N., long. 124°28′ E.); 92 meters; April 17, 1908. Six dead tests.

Station 5220, San Andreas Island (lat. 13°38′ N., long. 121°58′ E.); 92 meters; April 24, 1908. Several dead tests.

Station 5235, east of Mindanao (lat. 9°43′ N., long. 125°48′ E.); 82 meters; May 9, 1908. Several specimens, eight of them dead tests.

Station 5257, south of Mindanao (lat. 7°22′ N., long. 124°12′ E.); 51 meters; May 22, 1908. Eighteen dead tests and one live specimen.

Station 5302, China Sea (lat. 21°42′ N., long. 114°50′ E.); 70 meters; August 9, 1908. Nine specimens.

Station 5303, China Sea (lat. 21°44′ N., long. 114°48′ E.); 62 meters; August 9, 1908. Nineteen specimens.

Station 5304, China Sea (lat. 21°46′ N., long. 114°47′ E.); 62 meters; August 9, 1908. Several specimens.

Station 5335, Linapacan Strait (lat. 11°37′ N., long. 119°49′ E.); 84 meters; December 18, 1908. Eleven dead tests.

Station 5342, Palawan Island (lat. 10°57′ N., long. 119°17′ E.); 26–46 meters; December 23, 1908. Four live specimens and seven dead tests.

Station 5358 (lat. 6°07′ N., long. 118°18′ E.); 71 meters; January 7, 1909. Three dead tests.

Station 5369 (lat. 13°48′ N., long. 121°43′ E.); 194 meters; February 24, 1909. One dead fragmentary test.

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Station 5426, Palawan Island (lat. 9°12′ N., long. 118°28′ E.); 49 meters; April 3, 1909. One live specimen and two dead tests.

Station 5427, Palawan Island (lat. 9°11′ N., long. 118°37′ E.); 68 meters; April 3, 1909. Three live specimens and one dead test.

Station 5442, west of Luzón (lat. 16°31′ N., long. 120°11′ E.); 82 meters; May 10, 1909. Several small live specimens and several dead tests.

Station 5477, between Sámar and Leyte (lat. 10°45′ N., long. 125°12′ E.); 88 meters; July 29, 1909. Three live specimens and one dead test.

Station 5480, between Sámar and Leyte (lat. 10°45′ N., long. 125°19′ E.); 113 meters; July 29, 1909. Two dead tests.

Remarks.—Because of its poor condition the identification of the specimen from station 5369 is not beyond doubt.

From station 5206 there are a number of small dead tests of laganids, most of them broken. They are quite unidentifiable; since the genital pores have not appeared it is not even possible to tell with certainty whether they belong to *Laganum* or to *Peronella*, or to both of these genera.

LAGANUM DEPRESSUM Lesson

Laganum depressum L. Agassiz, Monographie des scutelles, p. 110, pl. 23, figs. 1–7, 1841.—A. Agassiz, Revision of the Echini, pp. 138, 518, pl. 13f, figs. 5–8, 1873.—de Meijere, *Siboga* Echinoidea, p. 114, pl. 6, fig. 57; pl. 18, figs. 317, 318, 1904.—H. L. Clark, Hawaiian and other Pacific Echini, Clypeastridae . . . Scutellidae, p. 45, pl. 124, figs. 7–12, 1914.—Koehler, Echinoderma of the Indian Museum, Echinoidea, pt. 2, p. 88, pl. 9, figs. 1, 2, 7, 8; pl. 13, fig. 3; pl. 14, fig. 2, 1922.—H. L. Clark, Catalogue of the Recent sea-urchins in the British Museum, p. 157, 1925.

Localities.—Subig Bay, shore; January 7, 1908. Three small specimens in fair condition.

Panabutan Bay; February 5, 1908. One test.

Station 5104, off southern Luzón (lat. 14°46′ N., long. 120°12′ E.); 60 meters; January 8, 1908. One specimen.

Station 5156, Tinakta Island (lat. 5°13′ N., long. 119°56′ E.); 33 meters; February 21, 1908. One specimen.

Station 5157, Tinakta Island (lat. 5°12′30″ N., long. 119°55′50″ E.); 33 meters; February 21, 1908. One dead broken test.

Station 5159, Tinakta Island (lat. 5°11′50″ N., long. 119°54′ E.); 18 meters; February 21, 1908. Three specimens.

Station 5160, Tinakta Island (lat. 5°12′ N., long. 119°55′ E.); 22 meters; February 22, 1908. One dead broken test.

Station 5161, Tinakta Island (lat. 5°10′15″ N., long. 119°53′ E.); 29 meters; February 22, 1908. Three broken tests and one good live specimen.

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Station 5164, Observation Island (lat. 5°01′40″ N., long. 119°52′20″ E.); 33 meters; February 24, 1908. Two broken tests and one live specimen of irregular outline.

Station 5212, east of Masbate (lat. 12°04′ N., long. 124°05′ E.); 198 meters; April 17, 1908. Three dead tests.

Station 5218, between Burias and Luzón (lat. 13°11′35″ N., long. 123°03′ E.); 37 meters; April 22, 1908. One young specimen.

Station 5242, Melampaya Sound, Palawan Island; 26–46 meters; December 23, 1908. One broken test.

Station 5408, between Cebu and Leyte; 290 meters; March 18, 1909. One broken test.

Remarks.—These specimens call for no comment, except one from station 5159 that is unusually elongate, 32 mm. long, but only 25 mm. broad. The one live specimen from station 5164 is abnormal, of quite irregular outline.

The depth of 159 fathoms (station 5408) is quite unusual for this species, otherwise it is not known from greater depths than about 45 fathoms. But since the specimen taken from this station is an old, broken test, it does not count; there is no certainty that it has actually been living in the place where collected.

LAGANUM FUDSIYAMA Döderlein

Laganum fudsiyama Döderlein, Arch. für Naturg., vol. 51, p. 32, 1885.—A. Agassiz and H. L. Clark, Bull. Mus. Comp. Zool., vol. 50, p. 249, 1907.—H. L. Clark, Hawaiian and other Pacific Echini, Clypeastridae . . . Scutellidae, p. 46, pl. 124, figs. 13–16; pl. 127, figs. 7, 8; pl. 140, figs. 3, 4; pl. 141, figs. 4–9, 1914; Catalogue of the Recent sea-urchins in the British Museum, p. 158, 1925.

Laganum solidum de Meijere, *Siboga* Echinoidea, p. 121, pl. 6, figs. 64, 66, 1904.

Laganum conicum de Meijere, *Siboga* Echinoidea, p. 120, pl. 6, fig. 68; pl. 18, figs. 325–328, 1904.

Laganum diploporum A. Agassiz and H. L. Clark, Bull. Mus. Comp. Zool., vol. 51, p. 129, 1907.—H. L. Clark, Hawaiian and other Pacific Echini, Clypeastridae . . . Scutellidae, p. 46, pl. 127, figs. 9–12; pl. 142, figs. 2–4, 1914.

Locality.—Station 5592, northeastern Borneo (lat. 4°13′ N., long. 118°28′ E.); 558 meters; September 29, 1909. One large, somewhat fragmentary, dead test, 56 mm. long.

Remarks.—Though in poor condition this specimen may with a fair degree of certainty be referred to the species *L. fudsiyama*, with which I think, in agreement with H. L. Clark, de Meijere's two species *L. solidum* and *L. conicum* are identical. Moreover, I must likewise regard *L. diploporum* A. Agassiz and H. L. Clark as identical with *L. fudsiyama*, the only essential character distinguishing it from the latter species, the doubling of the posterior genital pore, being not at all constant (as already realized by Clark), and there are no other reliable characters by which to distinguish them.

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Family FIBULARIIDAE

Genus ECHINOCYAMUS van Phelsum

ECHINOCYAMUS CRISPUS Mazzetti

Echinocyamus crispus MAZZETTI, Atti Soc. Nat. Modena, ser. 2, vol. 12, p. 239, 1893.—DE MEIJERE, *Siboga* Echinoidea, p. 105, pl. 6, figs. 48–50; pl. 17, fig. 300, 1904.—KOEHLER, Echinoderma of the Indian Museum, Echinoidea, pt. 2, p. 137, pl. 12, figs. 16, 17, 21, 1922.

Localities.—Station 5098, off southern Luzón (lat. 14°18′40″ N., long. 120°32′40″ E.); 70 meters; January 2, 1908. Several young specimens, all dead tests.

Station 5133 off Panabutan Point; 70 meters; February 6, 1908. Several specimens, all dead tests.

Station 5137, off Joló (lat. 6°04′25″ N., long. 120°58′30″ E.); 36.5 meters; February 7, 1908. Two dead tests.

Station 5143, off Joló (lat. 6°05′50″ N., long. 121°02′15″ E.); 35 meters; February 15, 1908. Ten dead tests.

Station 5144, off Joló (lat. 6°05′50″ N., long. 121°02′15″ E.); 35 meters; February 15, 1908. Several dead tests.

Station 5159, Tinakta Island (lat. 5°11′50″ N., long. 119°54′ E.); 18 meters; February 21, 1908. One dead test.

Station 5178, off Romblón (lat. 12°43′ N., long. 122°06′15″ E.); 133 meters; March 25, 1908. Two dead tests.

Station 5217, Anima Sola Island (lat. 13°20′ N., long. 123°14′15″ E.); 192 meters; April 22, 1908. Three dead tests.

Station 5220, San Andreas Island (lat. 13°28′ N., long. 121°58′ E.); 92 meters; April 24, 1908. Numerous young specimens, all dead tests.

Remarks.—The curious fact that among all these specimens not a single one was alive when taken indicates that this species lives buried rather deep in the ground. There is no certainty that it lives at so great a depth as 133–192 meters.

ECHINOCYAMUS PROVECTUS de Meijere

Echinocyamus provectus DE MEIJERE, *Siboga* Echinoidea, p. 109, pl. 6, figs. 51, 62; pl. 17, fig. 306; pl. 18, figs. 307–310, 1904.

Localities.—Station 5178, vicinity of Romblón; 133 meters; March 25, 1908. Three small dead tests.

Station 5313, China Sea, vicinity of Hongkong; about 275 meters; November 1908. One dead test.

Remarks.—Although the three specimens from station 5178 are beyond doubt *Echinocyamus provectus*, I do not feel sure about the one from station 5313; it may rather be referable to *E. scaber* de Meijere, but I do not think it possible to reach full certainty in the determination of this small dead test.

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Genus FIBULARIA Lamarck

FIBULARIA OVULUM Lamarck

Fibularia ovulum A. Agassiz, Revision of the Echini, pp. 129, 507, pl. 13, figs. 1–3, 1873.

Fibularia craniolaris H. L. Clark, Hawaiian and other Pacific Echini, Clypeastridae. . . Scutellidae, p. 57, 1914.—Koehler, Echinoderma of the Indian Museum, Echinoidea, pt. 2, p. 138, pl. 15, fig. 4, 1922.—H. L. Clark, Catalogue of the Recent sea-urchins in the British Museum, p. 163, 1925.

Localities.—Station 5133, off Panabutan Point; two meters; February 6, 1908. Several small dead tests.

Station 5159, Tinakta Island; 18 meters; February 19, 1908. Numerous small dead tests.

Station 5164, Observation Island; 33 meters; February 28, 1908. Several small dead tests.

Station 5217, Ánima Sola Island; 192 meters; April 21, 1908. One small, old, worn test.

Remarks.—That not a single one of these numerous specimens was alive when taken is, no doubt, due to the fact that this species lives buried rather deeply in the ground. Several of the specimens are old and worn, some of them more recently dead; in one of the specimens from station 5159 the characteristic radiating periproctal plates are preserved. In the old, worn specimens the pores of the petals are often somewhat enlarged.

In 1914 H. L. Clark took the ill-considered and very regrettable step of changing the hitherto unanimously used name *ovulum* of Lamarck to the name *craniolaris* of Leske, and later authors, myself included, have adopted the name *craniolaris* without going critically into the matter. It is only now that I have studied this nomenclatural question more carefully.

Leske, in his "Additamenta ad I.Th.Kleinii Naturalis Dispositio Echinodermatum," p. 214, 1778, designated by the name of *Echinocyamus craniolaris* the species represented in plate 1, figures 16–20, of van Phelsum's "Brief aan Corn. Nozeman over de Gewelv-Slekken of Zee-Egelen." It is true that the figures 18–20 resemble the high globose *Fibularia ovulum*, but figures 16 and 17 resemble more a flat form like *Echinocyamus pusillus*. It is evident that all van Phelsum's figures are grossly misdrawn and not recognizable with certainty. The only thing that is certain is that van Phelsum says that his specimens came from the Adriatic, where only *Echinocyamus pusillus* occurs. All agree that van Phelsum's 14 species are in reality only one and the same species, which leads to the conclusion that *craniolaris*, and all the other species of Leske based on the figures of van Phelsum, are in reality synonyms of *Echinocyamus pusillus*. Clark's action in taking Leske's species *craniolaris* to be identical with *Fibularia ovulum* in reality leads him to endorse Lambert's interchanging the two names

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Echinocyamus and *Fibularia*—a result that Clark, no doubt, would have emphatically rejected.

FIBULARIA OVULUM var. TRIGONA Lamarck

Fibularia trigona LAMARCK, Histoire naturelle des animaux sans vertèbres, vol. 3, p. 17, 1816.

Locality.—Station 5134, near Basilan Island (lat. 6°44′45″ N., long. 121°48′00″ E.); 45 meters; February 7, 1908. Two small dead tests.

Remarks.—These small specimens, only 2 mm. long, are, I think, though with some little doubt, referable to *Fibularia trigona* Lamarck. This species was hitherto not recognizable, but I have recently received photographs of the type specimen in the Paris Museum, which show that some specimens in my own collections which I had distinguished as a variety of *F. ovulum* are identical with *F. trigona.* The two above-mentioned specimens from the *Albatross* fit fairly well with *trigona*, but as they are evidently quite young, though the genital pores have already been formed, it is hardly possible to reach full certainty in their identification. So far as can be judged from the naked tests alone I do not think *F. trigona* can rank higher than as a variety of *F. ovulum.*

FIBULARIA CRIBELLUM de Meijere

Fibularia cribellum DE MEIJERE, *Siboga* Echinoidea, p. 112, pl. 6, figs. 53, 54; pl. 18, figs. 313, 314, 1904.

Localities.—Station 5143, Sulu Sea (lat. 6°05′50″ N., long. 121°02′ 15″ E); 35 meters; February 15, 1908. Ten specimens.

Station 5144, Sulu Sea (lat. 6°05′50″ N., long. 121°02′15″ E.); 18 meters; February 15, 1908. Four specimens.

Station 5148, Sulu Sea (lat. 5°35′40″ N., long. 120°47′30″ E); 31 meters; February 16, 1908. Three specimens.

Station 5159, Sulu Sea (lat. 5°11′50″ N., long. 119°54′ E.); 38 meters; February 18, 1908. Two specimens.

Remarks.—All these specimens are dead tests, more or less worn. None of them exceeds a size of 5 mm. in length; upon the whole this small species, well characterized by its few but large round pores of the petals, does not appear to grow longer than 7 mm.

FIBULARIA ACUTA Yoshiwara

Fibularia acuta YOSHIWARA, Annot. Zool. Japon., vol. 2, p. 60, 1898; Japanese Echini, pl. 14, figs. 3, 4, 1906.—H. L. CLARK, Hawaiian and other Pacific Echini, Clypeastridae . . . Scutellidae, p. 58, 1914.

Locality.—Station 5144, off Joló Strait (lat. 6°05′50″ N., long. 121°02′15″ E.); 35 meters; February 15, 1908. Four small dead tests.

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Remarks.—So far as it is possible to decide from dead tests alone, these specimens must be referable to *F. acuta;* but it would have been important to ascertain whether they agree with the typical *acuta* in the buccal membrane containing calcareous plates and in the presence of globiferous pedicellariae.

FIBULARIA sp. (?)

From Port Binang, Subic Bay, Luzón, there is a small dead test that I cannot with certainty identify with any known fibulariid. There are traces of internal radiating partition walls; I cannot therefore even say definitely whether it is an *Echinocyamus* or a *Fibularia.* It is too incomplete (apical system lost) for being described or named; but it may be worth while mentioning the existence of such a small fibulariid at the Philippines.

The specimen measures 4 by 3.2 by 2 mm. It is of ovoid outline. Petals short, with 3 or 4 pore-pairs. Peristome central, round; periproct much smaller, elliptical, midway between peristome and posterior end of test.

Order SPATANGOIDA

Family URECHINIDAE

Genus PLEXECHINUS A. Agassiz

PLEXECHINUS SPECTABILIS, new species

Locality.—Station 5359, Sulu Sea (lat. 8°13′ N., long. 120°37′ E.); 4,163 meters, January 9, 1909. Nine specimens, in the main in fair condition.

Type.—U.S.N.M. No. E. 7161 from station 5359.

Description.—The shape of the test is that typical of *Plexechinus*, only the anal snout is somewhat more projecting than in the other species of the genus. The sternum rises into a conspicuous keel. The largest specimen is 33 mm. long, 27 mm. broad, about 21 mm. high (the sternum broken); the smallest specimen is 28 mm. long, 23 mm. broad, 18 mm. high. There is no frontal depression, but adorally the frontal ambulacrum is somewhat depressed. The phyllode is fairly well developed, with 2 or 3 penicillate tube feet in each series, quite conspicuous on account of their dark, brownish color.

There are four genital pores, each superseded by a long genital papilla. The two anterior pores are placed in one unpaired plate, the two posterior pores each in its own large plate; the anterior and posterior genital pores are rather widely separated from each other by a couple of plates as large as the posterior genital plates; most probably these separating plates are the anterolateral ocular plates. The peristome is more or less conspicuously oblong. The upper part of the periproct may rise as a hood over the lower part; but there is a

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considerable variation in the outline of the periproct, from about as broad as long to longer than broad. Three or four interambulacral plates surround the periproct. The plate No. 4 of ambulacra Ia and Vb is traversed by the subanal fasciole, which includes three interambulacral plates. The test is densely covered by miliary tubercles among which rise the primary tubercles, scattered without order, few on the aboral side, but larger and more numerous toward the posterior end and along the sides of the test, as well as on the oral side, excepting the posterior ambulacra, where they are again smaller.

Of pedicellariae only the tridentate, ophicephalous, and triphyllous types are found, none of the globiferous and rostrate types. The tridentate pedicellariae have broad, simply leaf-shaped valves, with the edges of the basal part irregularly serrate; the largest examples measure 0.7–0.8 mm. in length of head, with a very short neck. Ophicephalous and triphyllous pedicellariae are not peculiar.

Color a light brownish or whitish.

Remarks.—From the only other species of *Plexechinus* with four genital pores, the sub-Antarctic *P. nordenskjöldi*, the present species differs markedly by the two anterior pores being situated in a single plate, the fused genitals 2 and 3; in *P. nordenskjöldi* these plates are separate, not fused.

This is much the largest of the species of *Plexechinus*, none of the other species exceeding 20 mm. in length.

The genus *Plexechinus* has thus been found to be represented also in the Malay region and may be expected to have a world-wide distribution; the three other species known are from the Gulf of California (*P. cinctus*), the North Atlantic (*P. hirsutus*), and the sub-Antarctic (*P. nordenskjöldi*).

Family ECHINOCORYTHIDÆ

Genus STEREOPNEUSTES de Meijere

STEREOPNEUSTES RELICTUS de Meijere

Stereopneustes relictus DE MEIJERE, *Siboga* Echinoidea, p. 148, pl. 5, figs. 41–43; pl. 19, figs. 390–393; pl. 20, figs. 394–407, 1904.—MORTENSEN, Annot. Zool. Japon., vol. 12, p. 393, 1930.

Localities.—Station 5116 (lat. 13°41′ N., long. 120°47′ E.); 622 meters; January 20, 1908. One specimen.

Station 5425 (lat. 9°38′ N., long. 121°11′ E.); 907 meters; March 31, 1909. One specimen.

Station 5527 (lat. 9°12′ N., long. 123°44′ E.); 741 meters; August 11, 1909. Two specimens.

Remarks.—The specimen from station 5425 is 90 mm. long, 85 mm. broad, and 67 mm. high, the largest specimen known of this species.

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The specimen from station 5116 is smaller, 70 mm. long, 63 mm. broad, and 45 mm. high; it is very badly broken and incomplete, but it was found possible to glue the fragments together so as to form a tolerably good specimen. Of the two specimens from station 5527 one is a very fine one, 75 mm. long, 70 mm. broad, and 61 mm. high; the other is slightly larger but badly broken and incomplete.

The two specimens from station 5527 are lighter in color than the others; they are brownish whereas the others are dark purplish. One might be tempted to regard them as forming another species than *relictus*, or a variety of the latter; but I do not think it justifiable on the basis of the material now available to separate them from the typical *relictus*. It is important that they do not differ from the typical *relictus* in the shape and characters of the test. In regard to the pedicellariae it is noteworthy that the ophicephalous type varies considerably, the valves being either broad as in the type or slenderer, with the blade distinctly narrower than the basal part; but the same is found in the specimen from station 5116, which is dark purplish like the type. We must therefore acknowledge as a fact that the ophicephalous pedicellariae of *S. relictus* may vary considerably in the shape of the valves, the various forms occurring in one and the same specimen; but in some specimens only the broad-valved form occurs, as appears to have been the case in the type specimens.

Globiferous pedicellariae (described by de Meijere as a particular kind of ophicephalous pedicellariae) I have found in the specimen from station 5425 but, unfortunately, not in the other specimen; if they had been found and proved to differ in shape from those of the type and of the specimen from station 5425, that would have been an important argument for regarding these light-colored specimens as different from the typical *relictus*.

Family PALAEOSTOMATIDAE

Genus PALAEOSTOMA A. Agassiz

PALAEOSTOMA MIRABILE (Gray)

Leskia mirabilis Gray, Ann. Mag. Nat. Hist., ser. 2, vol. 7, p. 134, 1851.

Palaeostoma mirabilis A. Agassiz, Revision of the Echini, p. 583, pl. 32, figs. 13–15, 1873.—H. L. Clark, Catalogue of the Recent sea-urchins in the British Museum, p. 193, 1925.

Palaeostoma mirabile Lovén, On Pourtalesia, p. 27, pl. 16, figs. 184–196, 1883.—de Meijere, *Siboga* Echinoidea, p. 172, 1904.—Koehler, Echinoderma of the Indian Museum, Echinoidea, pt. 1, Spatangidés, p. 36, pl. 3, figs. 1, 2, 6, 8, 9; pl. 17, figs. 19–29, 1914.

Locality.—Station 5206, Badian Island (lat. 11°32′ N., long. 124°41′ E.); 59 meters; April 14, 1908. One dead test, 12 mm. long.

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Family MICRASTERIDAE

ISOPATAGUS, new genus

Large forms of high, rounded-conical shape; oral side slightly convex. Test fairly strong. Ambulacra all equally developed, petaloid, slightly sunken. The pores remain distinct from the distal end of the petals to the edge of the test. Anterior end of the test rounded, not at all sunken. Apical system slightly anterior, ethmophract, with three genital pores. Mouth very near the anterior end, with fairly prominent labrum. Periproct inframarginal, very small, of ovoid outline. Test densely tuberculated with very small, uniform tubercles. Spines uniform, smooth, only about 5 mm. long. No fascioles. Pedicellariae of only the tridentate and triphyllous types. Color dark purplish, the denuded test whitish.

Genotype: *Isopatagus obovatus*, new species.

This interesting genus is nearly related to the Cretaceous genus *Isaster* Desor, of the *Micraster* group, no recent forms of which were known till now.

ISOPATAGUS OBOVATUS, new species

Locality.—Station 5425, Sulu Sea (lat. 9°38′ N., 121°11′ E.); 907 meters; March 31, 1909. Four specimens, one of them very badly broken, but the fragments could be fitted together so as to form a tolerably complete specimen.

Type.—U.S.N.M. No. E.7149, from station 5425.

Description.—The diagnosis of the genus applies equally well to the species, this being the only one so far known. It need only be added that the tridentate pedicellariae have slender valves, somewhat involuted in the lower part of the blade; the epiphysis usually has a small prominence at its upper end. They are on the whole small and very inconspicuous, hardly exceeding 0.5 mm. in length of head.

Family PALAEOPNEUSTIDAE

Genus ARGOPATAGUS A. Agassiz

ARGOPATAGUS VITREUS A. Agassiz

Argopatagus vitreus A. Agassiz, *Challenger* Echinoidea, p. 160, pl. 32, figs. 1–6, 1881.—H. L. Clark, Hawaiian and other Pacific Echini, Echinoneidae . . . Spatangidae, p. 146, 1917.

Phrissocystis humilis de Meijere, *Siboga* Echinoidea, p. 198, pl. 10, figs. 99, 100; pl. 23, figs. 494–500, 1904.

Meijerea humilis Döderlein, Echinoidea d. deutschen Tiefsee-Exped., p. 243, pl. 31, figs. 1–4; pl. 49, fig. 7, 1906.

Meijerea excentrica A. Agassiz and H. L. Clark, Bull. Mus. Comp. Zool., vol. 50, p. 252, 1907; vol. 51, p. 132, 1907.

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Localities.—Station 5630, Patiente Strait (Halmahera) (lat. 0°56′ S., long. 127°05′ E.); 1,480 meters; December 2, 1909. One rather large specimen, about 100 mm. long, fairly complete though badly broken.

Station 5660, Flores Sea (lat. 5°36′ S., long. 120°49′ E.); 1,266 meters; December 20, 1909. Fragments of two or three specimens.

Genus LINOPNEUSTES A. Agassiz

LINOPNEUSTES MURRAYI (A. Agassiz)

Paleopneustes murrayi A. AGASSIZ, Proc. Amer. Acad. Arts and Sci., vol. 14, p. 210, 1879.

Linopneustes murrayi A. AGASSIZ, *Challenger* Echinoidea, p. 168, pl. 25, 1881.—H. L. CLARK, Hawaiian and other Pacific Echini, Echinoneidae . . . Spatangidae, p. 223, 1917; Catalogue of the Recent sea-urchins in the British Museum, p. 223, 1925.

Localities.—Station 5582 (lat. 4°20′ N., long. 118°58′ E.); 1,480 meters; September 26, 1909. One specimen.

Station 5618 (lat. 0°37′ N., long. 127°15′ E.); 763 meters; November 27, 1909. One specimen.

Station 5648 (lat. 5°35′ S., long. 122°20′ E.); 1,023 meters; December 16, 1909. One specimen.

Remarks.—All these specimens are badly broken, but it has been possible to glue the fragments together so as to give a fair idea of their shape and size. The largest, the one from station 5582, is 92 mm. long, about 50 mm. high, and 80 mm. broad; the two others are a little smaller, about 80 mm. long.

They agree very closely with the illustrations given in the *Challenger* Echini, plate 25; particularly the spine-covering is quite as shown there, the spines being short and fairly robust. In a specimen at hand from Japan, a cotype, the spines are somewhat slenderer; but I think it beyond doubt that these specimens are identical with the typical form from the Japanese seas. It is not quite clear whether the specimen(s) taken in the Philippine seas by the *Challenger* (station 210) are actually *L. murrayi* (the fragments of a large specimen mentioned by A. Agassiz, p. 168, are rather certainly *L. spectabilis*); but the specimens collected by the *Albatross* prove that *L. murrayi* occurs in the Philippine seas.

LINOPNEUSTES FRAGILIS (de Meijere)

Palaeopneustes fragilis DE MEIJERE, *Siboga* Echinoidea, p. 175, pl. 9, figs. 90–93; pl. 21, figs. 427–432; pl. 22, figs. 433–437, 1904.—H. L. CLARK, Hawaiian and other Pacific Echini, Echinoneidae . . . Spatangidae, p. 145, 1917.

Localities.—Station 5447 (lat. 13°28′ N., long. 123°46′ E.); 567 meters; June 4, 1909. Two specimens.

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Station 5460 (lat. 13°32′ N., long. 123°58′ E.); 1,034 meters; June 9, 1909. One specimen.

Station 5508 (lat. 8°17′ N., long. 124°12′ E.); 494 meters; August 5, 1909. One specimen.

Station 5657 (lat. 3°20′ S., long. 120°36′ E.); 900 meters; December 19, 1909. One specimen.

Station 5658, Gulf of Boni (lat. 3°33′ S., long. 120°31′ E.); 933 meters; December 19, 1909. Five specimens.

Remarks.—All these specimens, except the one from station 5508, were badly broken (particularly those from station 5658, very badly crushed), but it was possible to glue the fragments together so as to form fairly complete specimens, especially the largest one. The specimen from station 5508 has the oral side complete, only the labrum being broken, and thus gives important information about the characters of the oral side, hitherto incompletely known. It is of great interest that the plates 6–8 of the ambulacral series adjoining the sternum are adproctally prolonged, the plates 7 and 8 having their pores at their adproctal end. This indicates that a subanal fasciole is typically present in this species, even though it is obliterated in the adult; it will be sure to be present in the young specimens. But it is herewith made evident that this species has nothing to do with *Palaeopneustes*, the genotype of which, *P. cristatus* (A. Agassiz), has no trace of a subanal fasciole even in the youngest specimens, and no adproctal prolongation of the adjoining ambulacral plates (as also the pedicellariae are very different from those of the present species). There can be no doubt that this species belongs to the genus *Linopneustes*, being very closely related to the genotype of that genus, *L. murrayi* (A. Agassiz).

The specimen from station 5657 is a very large one, 160 mm. long, 135 mm. broad, and 115 mm. high. This is thus by far the largest on record; the largest specimen from the *Siboga* was 113 mm. long. The smallest of the *Albatross* specimens is 115 mm. long.

LINOPNEUSTES SPECTABILIS (de Meijere)

Palaeopneustes spectabilis DE MEIJERE, *Siboga* Echinoidea, p. 172, pl. 8, figs. 86–90; pl. 21, figs. 422–426, 1904.—H. L. CLARK, Hawaiian and other Pacific Echini, Echinoneidae . . . Spatangidae, p. 145, 1917.

Linopneustes spectabilis KOEHLER, Echinoderma of the Indian Museum, Echinoidea, pt. 1, Spatangidés, p. 62, pl. 5, figs. 3, 6; pl. 11, figs. 7, 8; pl. 17, figs. 36–51, 1914.

Localities.—Station 5491 (lat. 9°24′ N., long. 125°12′ E.); 1,347 meters; August 1, 1909. One young specimen, fairly complete.

Station 5492 (lat. 9°13′ N., long. 125°20′ E.); 1,345 meters; August 1, 1909. Four more or less fragmentary specimens, the largest 90 mm. long.

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Station 5494 (lat. 9°06′ N., 125°19′ E.); 1,241 meters; August 2, 1909. One fairly complete specimen, 82 mm. long.

Station 5511 (lat. 8°15′ N., long. 123°57′ E.); 750 meters; August 7, 1909. Fragments of two young specimens.

Station 5512 (lat. 8°16′ N., long. 123°58′ E.); 814 meters; August 7, 1909. One specimen 95 mm. long, oral side lacking, and fragments of two smaller specimens.

Station 5528 (lat. 9°25′ N., long. 123°39′ E.); 803 meters; August 11, 1909. Two large specimens, plastron lacking, and one smaller, almost complete specimen.

There are also a couple of fragments of a large specimen, without label.

Remarks.—The two larger specimens from station 5528 are 135 mm. long, 114 mm. broad, and 60 mm. high; the smaller specimen is 80 mm. long, 67 mm. broad, and 27 mm. high. The young specimen from station 5491 is 40 mm. long, 32 mm. broad, and 13 mm. high; this is the smallest specimen known of this species. Genital pores do not appear until a length of about 80 mm. is reached; this is in good accordance with the large size to which this species grows. The test of the young specimens is, on the whole, low, not at all conical or subconical, as is the case in the adult specimens, and recalls to no small degree *Argopatagus vitreus*, from which it is, however, at once distinguished by its well-developed petals and by the conspicuous notch in the front end of the test, as well as by the presence of a peripetalous (or marginal) and a subanal fasciole. It is particularly important that there is a well-developed subanal fasciole in these young specimens; also one of the large specimens has a well-developed subanal fasciole, whereas the other one has only an incomplete subanal fasicole, only the anterior part of it being present. The presence of the subanal fasciole in this specimens proves that Koehler (*op. cit.*) was right in referring this species to the genus *Linopneustes*.

The pedicellariae were very carefully described and figured by Koehler (*op. cit.*). The two large specimens from station 5528 are in a very poor state of preservation and show only a very few of the slender form of tridentate pedicellariae; in the small specimens pedicellariae are fairly numerous; some of the tridentate pedicellariae have four valves. Only a single example of the characteristic coarse form of tridentate pedicellariae (cf. Koehler, *op. cit.*, pl. 17, figs. 42, 45, 46, 49) was observed. Of considerable interest is the fact that ophicephalous pedicellariae are found on the oral side of the young specimens, in the posterior part of the posterior ambulacra. The values are constricted in the middle, thus very different from the peculiar ophicephalous pedicellariae of *Argopatagus*. Even a sort of globiferous pedicellariae, with remarkably irregular valves, occurs—but very rarely—in the young specimens.

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Genus HOMOLAMPAS A. Agassiz

HOMOLAMPAS LOVENIOIDES, new species

Locality.—Station 5650, Gulf of Boni (lat. 4°54′ S., long. 121°29′ E.); 988 meters; December 17, 1909; two specimens.

Type.—U.S.N.M. No. E.7150, from station 5650.

Description.—The two specimens are of the same size, 31 mm. long, 25 mm. broad, and 16 mm. high; but they differ somewhat in shape, one of them, the holotype, having the greatest width more anteriorly than the other, the paratype; also the test rises in the type more sharply from the anterior edge toward the apical system than in the paratype. In general the shape of the test resembles that of *Homolampas fragilis*, only the sides rise less steeply toward the apical system than in *H. fragilis*. Although the test is very fragile, the two specimens are in fair condition, particularly the type specimen.

In the characters of the ambulacra and interambulacra this new species very closely resembles *H. fragilis;* it is of particular importance that there are no primary spines in the odd posterior interambulacrum. The labrum appears to offer a good distinguishing character, its posterior prolongation reaching in the new species to the middle of plate 3 of the adjoining ambulacra, not beyond plate 2 in *H. fragilis*. The number of genital pores is four in the type, three in the paratype; it is thus impossible to tell what is the normal number of the genital pores. There is no trace of a peripetalous fasciole (likewise lacking in *H. fragilis*); the subanal fasciole appears to be somewhat broader (three times as broad as long) in the present species than in *H. fragilis* (twice as broad as long). The primary aboral spines are (so far as preserved) unilaterally serrate (as in *fragilis*); the spines of the plastron are conspicuously serrate along the convex side. There are three tube feet to each side within the subanal fasciole. The pedicellariae are, as in *H. fragilis*, of the five usual types, globiferous, tridentate, rostrate, ophicephalous, and triphyllous. The globiferous pedicellariae, which are found only on the aboral side, between the secondary spines, have the valves terminating in one or two long teeth. On the whole the pedicellariae are very much like those of *H. fragilis*, only the valves of the rostrate pedicellariae are somewhat slenderer. The color is white.

Remarks.—This species so closely resembles the West Indian *Homolampas fragilis* that were they found together they would probably be regarded as the same species; but since one is known only from the West Indies and the mid-Atlantic and the other only from the Malay region, they must be regarded as distinct species, at least so long as they are not known from intermediate localities (South Atlantic; Indian Ocean)

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The species name *lovenioides* might apply equally well to the other species of the genus *Homolampas*, which not only in its general appearance strongly recalls, but, in my opinion, also actually is closely related to *Lovenia*.

Genus PALAEOTREMA Koehler

PALAEOTREMA LOVENI (A. Agassiz)

Palaeotropus loveni A. Agassiz, *Challenger* Echinoidea, p. 158, pl. 21, figs. 3–16; pl. 39, fig. 33; pl. 41, figs. 28, 29, 1881; Panamic Deep-sea Echini, p. 168, pl. 87, 1904.—de Meijere, *Siboga* Echinoidea, p. 200, 1904.—H. L. Clark, Hawaiian and other Pacific Echini, Echinoneidae . . . Spatangidae, p. 153, 1917; Catalogue of the Recent sea-urchins in the British Museum, p. 197, 1925.

Palaeotrema loveni Koehler, Echinoderma of the Indian Museum, Echinoidea, pt. 1, Spatangidés, p. 45, 1914.

Localities.—Station 5183, between Panay and Negros (lat. 10°32′48″ N., long. 122°26′ E.); 176 meters; March 30, 1908. Fourteen specimens, most of them in fair condition.

Station 5421, between Panay and Guimarás (lat. 10°33′30″ N., long. 122°26′ E.); 251 meters; March 30, 1909. Three specimens in poor condition.

Remarks.—These specimens range from 17 to 26 mm. in length of the test, the 26 mm. being the largest size hitherto recorded. It is then very probable that the species does not reach any larger size, and this conclusion is based on a fairly good number of specimens.

It is noteworthy that only two or three of the *Albatross* specimens are narrower anteriorly than behind, as shown in the *Challenger* Echinoidea, pl. 31, figs. 3, 4, this shape being emphasized by both A. Agassiz and H. L. Clark as particularly characteristic of this species; the others are regularly oval in outline, or slightly broader in the middle. Accordingly, the shape of the test is not a reliable specific character.

Genus PLESIOZONUS de Meijere

PLESIOZONUS DIOMEDEAE, new species

Localities.—Station 5242 (lat. 6°52′ N., long. 126°14′ E.); 360 meters; May 14, 1908. Fragments of 10 specimens.

Station 5520 (lat. 8°41′ N., long. 123°18′ E.); 187 meters; August 10, 1909. Two specimens.

Type.—U.S.N.M. No. E. 7151, from station 5520.

Description.—In general appearance this species resembles *Plesiozonus hirsutus* de Meijere, but it differs markedly from it in several important characters. The frontal ambulacrum is somewhat sunken, producing a distinct notch at the front edge of the test, which is not at all the case in *hirsutus*, which has the front edge simply rounded. The last 1–3 plates of the petals are occluded from the edge of the ambulacra; in *hirsutus* it is some alternating plates in the distal part

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of the petals which are thus occluded. The labrum is straight cut at the anterior end, whereas in *hirsutus* it is quite prominent. The periproct is marginal, in *hirsutus* inframarginal.

The specimens are all large and high, but somewhat different in outline, as appears from the following measurements of two specimens: (1) 130 mm. long, 123 mm. broad, 75 mm. high; (2) 115 mm. long, 115 mm. broad, 81 mm. high.

One of the specimens (all of them dry) has the spines fairly well preserved. They are quite short, as in *P. hirsutus*. The pedicellariae are as in *hirsutus*, but in the present species also rostrate pedicellariae are found, even in great numbers, this type of pedicellariae being unknown in *hirsutus*.

The characters pointed out above leave no doubt that the specimens collected by the *Albatross* are specifically different from those collected by the *Siboga*. One would have expected them to be identical with the single specimen of *Plesiozonus* hitherto known (from the Flores Sea); but this is evidently not the case, to judge from the description and figures given by de Meijere, the correctness of which it is hardly permissible to doubt. It is particularly to be emphasized that all the specimens agree in the important character of the petals that the last 1–3 plates are occluded.

The specimens from station 5242 were all very badly crushed, but it has been possible to fit the fragments together so as to form tolerably complete specimens.

Family HEMIASTERIDAE

Genus PERICOSMUS L. Agassiz

PERICOSMUS MELANOSTOMUS, new species

Locality.—Station 5302, China Sea, near Hongkong (lat. 21°42′ N., long. 114°50′ E.); 70 meters; August 9, 1908. One specimen.

Type.—U.S.N.M. No. E.7153, from station 5302.

Description.—The specimen, which is in good condition except somewhat bleached, is a young one, only 12 mm. long, the genital pores still wanting. That it represents a new distinct species is, however, beyond doubt. The fact that I dredged in 1922 in the Sunda Strait a goodly number of specimens in every respect agreeing with the specimen collected by the *Albatross* serves to confirm the validity of this species, the second recent species of the genus *Pericosmus* made known.

The test is egg-shaped, the oral side convex, not flattened; the frontal depression is very shallow (more pronounced in larger specimens). The posterior edge is vertical, the periproct close to the upper edge. The petals are only slightly sunken, short, but rather broad; the posterior only about half as long as the anterior petals. Frontal ambulacrum somewhat broader than the petals, tube feet large, with a

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conspicuous sucking disk. The fascioles very conspicuous; the peripetalous fasciole not bending inward between the petals. Labrum not forming a prominent lip; its posterior prolongation ends off the middle of the second adjoining ambulacral plates, as usual in the genus. Globiferous pedicellariae lacking (in all the specimens available). Very characteristic is the presence of two sorts of ophicephalous pedicellariae, the larger with broad valves, the blade much shorter and usually broader than the basal part. The general color is whitish with a tinge of purplish, but the peristome, periproct, and the frontal tube feet are a very conspicuous dark purplish.

This species apparently bears no relation to any of the fossil species of *Pericosmus* known from the Malay region.

Genus FAORINA Gray

FAORINA CHINENSIS Gray

Faorina chinensis GRAY, Ann. Mag. Nat. Hist., ser, 2, vol. 7, p. 132, 1851.—A. AGASSIZ, Revision of the Echini, p. 607, pl. 19a, figs. 4–6, 1873.—KOEHLER, Echinoderma of the Indian Museum, Echinoidea, pt. 1, p. 129, pl. 13, figs. 14, 15; pl. 19, figs. 14–24, 1914.—H. L. CLARK, Catalogue of the Recent sea-urchins in the British Museum, p. 203, 1925.

Locality.—Station 5335 (lat. 11°37′ N., long. 119°49′ E.); 84 meters; December 18, 1908. One specimen, 59 mm. long, in rather fine state of preservation.

Genus HEMIASTER Desor

HEMIASTER EXPERGITUS var. GIBBOSUS A. Agassiz

Hemiaster gibbosus A. AGASSIZ, *Challenger* Echinoidea, p. 184, pl. 20, figs. 5, 16, 22, 1881.

Hemiaster expergitus, var. *gibbosus* MORTENSEN, *Ingolf* Echinoidea, vol. 2, pp. 103–104, 1907.

Hemiaster expergitus H. L. CLARK, Hawaiian and other Pacific Echini, Echinoneidae. . . . Spatangidae, p. 165, 1917.

Localities.—Station 5127, Nogas Island, Sulu Sea (lat. 10°03′ N., long. 121°48′ E.); 1,753 meters; February 4, 1908. One large badly broken specimen.

Station 5410, between Cebu and Leyte (lat. 10°29′ N., long. 124°05′ E.); 705 meters; March 18, 1909. Two young specimens, badly broken.

Station 5650, Gulf of Boni (lat. 4°54′ S., 121°29′ E.); 988 meters; December 17, 1909. One young specimen.

Remarks.—The specimen from station 5127 measures 56 mm. in length and is the largest recorded, but whether it is also the largest found till now is unknown, because Clark does not say anything about the size of the numerous specimens taken by the *Albatross* in the Japanese waters. The specimen was badly broken into fragments,

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but I have succeeded in restoring the specimen to some degree, so that we can at least measure its length.

In my *Ingolf* Echinoidea, *loc. cit.*, I concluded that the *Hemiaster gibbosus* of A. Agassiz cannot be maintained as a distinct species beside the Atlantic *H. expergitus*, but in view of their wide geographical separation I thought it advisable to keep the form from the Malay region as a separate variety, var. *gibbosus*. Clark did not agree therewith, but regarded the latter as simply identical with *expergitus*. I cannot agree with him in this. So long as we know one form only from the Atlantic, the other only from the Malay region and Japan I do not think it justifiable to regard them as identical. If they were actually identical, we would be sure to find some specimens also in other regions, e. g., the Indian Ocean or in the southern Pacific, indicating its distribution to be continuous. But so far no specimens have been found in any connecting locality. I rather expect that, when once an extensive series of both forms becomes available, characters will be found by which we shall be able actually to distinguish them.

Genus HYPSELASTER H. L. Clark

HYPSELASTER AFFINIS, new species

Localities.—Station 5469, Atalayan Island (lat. 13°37′ N., long. 123°28′ E.); 915 meters; June 18, 1909. One very fragmentary specimen.

Station 5582, Darvel Bay, Borneo (lat. 4°20′ N., long. 118°59′ E.); 1,629 meters; September 26, 1909. Two broken specimens.

Station 5637, vicinity of Bouro (lat. 3°53′ S., long. 126°48′ E.); 1,281 meters; December 10, 1909. Fragments of two dead tests.

Type.—U.S.N.M. No. E.7152, from station 5582.

Description.—The type, the better of the two specimens from station 5582, is 48 mm. long, about 40 mm. broad, and 32 mm. high; the second specimen from the same station is 48 mm. long, 38 mm. broad, and 31 mm. high. The other specimens are too fragmentary to permit measuring them. The greatest height of the test is just behind the peripetalous fasciole, from where it slopes gradually backward; the posterior end of the test is subvertical, slightly inward-sloping, and distinctly concave. The anterior end of the test is 16–17 mm. high, rounded; it is thus only about half as high as the posterior end.

The petals are rather much sunken. The posterior petals are somewhat less than half the length of the anterior ones, which latter are straight, only their anterior border lightly convex. The plates of the anterolateral ambulacra outside the petals with only one or two tubercles, or naked. The frontal ambulacrum less sunken and also narrower than the petals; at the peripetalous fasciole it rises almost to the level of the test, and there is only a faint depression in the frontal

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edge of the test. The plates of the frontal ambulacrum below the fasciole are narrow and naked. There are three well-developed (? penicillate) tube feet to each side of the episternum. Phyllodes little developed; the three first plates of the anterolateral ambulacra with penicillate tube feet.

The anterolateral and the posterior interambulacra form rather sharp keels, less so the posterolateral interambulacra. The sternum is moderately broad, narrowing anteriorly; the tubercles continue to the anterior end, where the sternum meets the posterior prolongation of the labrum, which does not pass beyond the end of the first adjoining ambulacral plates. The labrum forms a prominent lip with reversed edge. Peristome small, 6 mm. broad, 3 mm. long; the mouth opening large; the peristomial membrane contains only small, rounded plates, which are not contiguous. The first interambulacral plates are broadly in contact with the peristome. The apical system is distinctly posterior, 28 mm. from the anterior, 20 mm. from the posterior end. The madreporite does not extend beyond the posterior ocular plate, and the madreporic pores are confined to the part between and a little anterior to the two large genital pores. The periproct, which is situated at the upper edge of the concave posterior end, is round or irregularly oval; the anal opening is nearer the lower edge, the periproctal plates at the upper edge being the largest.

The very conspicuous peripetalous fasciole bends only slightly inward between the petals, the latero-anal fasciole distinct only as a straight line below the periproct.

The globiferous pedicellariae I have found only on the aboral side, in the petals and in the frontal ambulacrum; the valves terminate in a single tooth. The other pedicellariae are not peculiar. Ophicephalous pedicellariae are not found on any of the specimens at hand.

The color, which is well preserved on the type specimen, is dark brownish on the aboral side in the anterior part but gradually fades behind the peripetalous fasciole, the posterior part being whitish. On the oral side the same dark color is found also at least in the posterior part of the sternum. The peripetalous fasciole is also dark brown and very conspicuous. In the specimen from station 5460 the aboral side is more light brownish, and no dark color is found on the sternum.

Remarks.—It seems evident that this species is nearly related to *Hypselaster fragilis* H. L. Clark; it bears particularly a considerable likeness to the specimen figured in his Catalogue of the Recent Sea-urchins of the British Museum, plate 11, figures 1–3, and one might be tempted to regard it as identical with that species. However, it differs from *fragilis* in the important character of the apical system being distinctly posterior, whereas it is central or anterior in *fragilis*. Further, in the analysis of the test given in Clark's Hawaiian and other Pacific Echini, Echinoneidae . . . Spatangidae plate 148, figure 8, the

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plates No. 1 of the posterolateral interambulacra are seen to be excluded from the peristome, while in *affinis* they are broadly in contact therewith. If this be correct, and a constant character, the identity of *affinis* with *fragilis* is unthinkable. But the type of *H. fragilis* (from Japan) is a young specimen, only 16 mm. long, as yet without genital pores; and the second specimen (from the Arafura Sea, 28 fathoms) has not been more closely studied, so that we do not know its characters more exactly—and Clark himself was in doubt as to its identity with the type of *H. fragilis.* Thus it is impossible for the present to form a definite opinion of the relation between *fragilis* and *affinis* and their possible identity. Another near relation of *affinis* appears to be the West Indian *H. brachypetalus* H. L. Clark.

Family SPATANGIDAE

Genus BRISSOPSIS L. Agassiz

BRISSOPSIS SIMILIS, new species

Localities.—Station 5188, east of Negros (lat. 9°44′ N., long. 123°14′ E.); 364 meters; April 1, 1908. Eight young specimens in poor condition, mainly naked tests.

Station 5201, south of Leyte (lat. 10°10′ N., long. 125°04′ E.); 1,014 meters; April 10, 1908. One specimen (the type) in good condition.

Station 5203, south of Leyte (lat. 9°58′ N., long. 125°08′ E.); 1,418 meters; April 10, 1908. One fragmentary specimen.

Station 5350, Palawan Passage (lat. 10°47′ N., long. 118°29′ E.); 942 meters; December 27, 1908. One small naked test.

Station 5487, Panaón Island (lat. 10°03′ N., long. 125°03′ E.); 1,340 meters; July 31, 1909. Five specimens, partly fragmentary.

Station 5488, Panaón Island (lat. 10′ N., long. 125°07′ E.); 1,413 meters; July 31, 1909. Four specimens, partly fragmentary.

Station 5513, north of Mindanao (lat. 8°17′ N., long. 124°03′ E.); 924 meters; August 7, 1909. One large specimen in good condition.

Station 5527, near Bohol (lat. 9°22′ N., long. 123°43′ E.); 717 meters; August 11, 1909. Two specimens in fair condition.

Station 5529, near Bohol (lat. 9°24′ N., long. 123°40′ E.); 807 meters; August 11, 1909. Two specimens, one nearly complete, the other badly broken.

Type.—U.S.N.M. No. E.7154, from station 5201.

Description.—In the character of the petals this species closely resembles *Brissopsis luzonica;* but the profile of the test is characteristically different, much higher posteriorly than *luzonica*, and while in the latter species the posterior end of the test is vertical, in *similis* it slopes outward. Otherwise the outline of the test is similar in both species, and the size is about the same; the largest specimen is 66

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mm. long. Another marked difference between the two species is found in the anterolateral ambulacra outside the petals; in both species they are very narrow, but while in *luzonica* each plate carries one or a few tubercles, in *similis* they are quite naked (apart from the minute miliary tubercles observable only on a higher magnification). This character is particularly useful for distinguishing the young specimens of the two species, the tubercles being present already in quite young specimens of *luzonica*. As in *luzonica*, there are four penicillate tube feet to each side within the subanal fasciole.

A further conspicuous character of *B. similis* is that the adapical tube feet of the frontal ambulacrum are very long, almost black, with a small, lobed sucking disk; no spicules are found in these tube feet. The anal branches from the subanal fasciole are distinct. Finally the pedicellariae, particularly the globiferous ones, offer a very marked distinction from *luzonica;* while in the latter species the valves of the globiferous pedicellariae, both sorts of them, terminate in two long divergent teeth; in *similis* they terminate in six small teeth surrounding a terminal opening. The tridentate pedicellariae are usually 4-valved; the valves have some long thorns along the edges of the lower part of the blade. The rostrate and ophicephalous pedicellariae are like those of *luzonica*, but only one form of the ophicephalous pedicellariae has been observed.

It is interesting to find that this is the species common in the deeper parts of the Philippine seas, while *B. luzonica* was not taken there at all by the *Albatross*.

BRISSOPSIS MICROPETALA, new species

Localities.—Station 5201, Leyte Island (lat. 10°10′ N., long. 125°04′ E.); 1,014 meters; April 10, 1908. One specimen.

Station 5424, Joló Sea (lat. 9°37′ N., long. 121°13′ E.); 622 meters; March 31, 1909. One young specimen.

Station 5468, Atalayan Island (13°36′ N., long. 123°40′ E.); 1,041 meters; April 18, 1909. Two fragmentary specimens, which must be regarded as belonging to a variety of the species; see below.

Station 5513, north of Mindanao (lat. 8°17′ N., long. 124°03′ E.); 924 meters; August 7, 1909. Three large specimens.

Station 5520, Mindanao (lat. 8°41′ N., long. 123°18′ E.); 187 meters; August 10, 1909. One specimen.

Station 5527, near Bohol (lat. 9°22′ N., long. 123°43′ E.); 717 meters; August 11, 1909. Five specimens.

Type.—U.S.N.M. No. E.7155, from station 5513.

Description.—This species is characteristic by the shape of its test, which is almost as broad as long; it is rather low, rising gradually toward the posterior end, the point of greatest height. The posterior

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end is vertical or at most sloping very slightly posteriorly. It reaches a conspicuous size, the largest specimen being 76 mm. long.

The shape of the petals is like that of *luzonica*, or even rather that of *B. parallela*, the posterior petals being to a high degree confluent, diverging only at the very end. Together with the narrow separating bridge of the posterior interambulacrum they are, in the adult specimens, quite markedly sunken. The whole of the petaloid area is remarkably small, less than half the length of the test. The plates of the anterolateral ambulacra outside the petals are rather broad, each with a number of tubercles, leaving the midline naked. It is a rather peculiar feature that fairly large conical tube-feet issue from the innermost 4 or 5 rudimentary pores of the anterior series of the anterolateral petals. There are only 3 tube feet to each side within the subanal fasciole. The edge of the sucking disk of the frontal ambulacrum is not lobed.

The anal branches from the subanal fasciole are lacking; in one specimen, however, the merest traces of these branches are observable.

The globiferous pedicellariae occur in one form only; the valves are coarse, terminating in two strong teeth. These pedicellariae occur mainly in the anterior ambulacra on the oral side but may sometimes be found also in the posterior ambulacra and even in great numbers; they are very dark colored. The tridentate pedicellariae occur in two forms, one with slender valves, with the edges rather coarsely dentate in the lower part of the blade, the other with broad, spoon-shaped valves; this latter form is found only in the petals. Ophicephalous pedicellariae appear to be totally lacking.

Remarks.—The two specimens from station 5468 differ from the others in having the posterior petals distinctly longer than the anterior ones. Only the aboral side of the test is preserved, though not completely; it has the appearance that the petals are less broad than is typical of the species. Not one of the characteristic broad-valved tridentate pedicellariae is found; but the conical tube feet of the adapical rudimentary pores of the anterior series of the anterolateral petals are well developed, and the plates outside the petals of the anterolateral ambulacra are broad and tuberculated as typical of *B. micropetala*. I think it the best course for the present to designate these specimens as a variety of *B. micropetala* without giving a definite varietal name, because there is no certainty that they actually belong to this species.

BRISSOPSIS OBLIQUA, new species

Locality.—Station 5421, between Panay and Guimarás; 251 meters; March 20, 1909. Three specimens.

Type.—U.S.N.M. No. E.7156, from station 5421.

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Description.—The largest of the three specimens is 40 mm. long, 28 mm. broad, and 17 mm. high, the others a little smaller. The test is very elongate and narrow; the greatest breadth is at the middle of the test, from where it narrows gently toward both ends. The greatest height is behind the posterior petals; from there the test slopes very gradually toward the posterior end, the periproct being completely visible when the test is viewed from above. The frontal depression is moderate; oral side flat, but the narrow sternum rising into a conspicuous knob at its posterior end. The peristome is placed rather far from the anterior edge. The labrum reaches posteriorly to the middle of the second adjoining ambulacral plates. Five ambulacral plates reach within the subanal fasciole, the first of them being the sixth. The petals are rather short but relatively broad and only slightly sunken; the posterior petals are confluent proximally, but the pores of the inner (posterior) series are rudimentary only in about the proximal half of the petal. The tube feet of the frontal ambulacrum are long and reddish, with an unlobed sucking disk. The apical system is central. The periproct is produced at its upper end.

It is a noteworthy feature that the spines within the subanal fasciole form a pair of conspicuous tufts. The peripetalous fasciole bends only slightly inward between the petals. The subanal fasciole is almost circular, nearly as high as it is broad; the anal branches are well developed.

The globiferous pedicellariae have rather slender valves, terminating in two long divergent teeth. The tridentate pedicellariae have very simple, narrow valves. Rostrate pedicellariae not peculiar; ophicephalous pedicellariae appear to be lacking.

Color of test and spines whitish, but the subanal fasciole somewhat darker and thus quite conspicuous.

Remarks.—The strongly sloping posterior end of the test, the posterior prolongation of the labrum, reaching to the middle of the second adjoining ambulacral plates, and the conspicuous tufts formed by the spines within the subanal fasciole distinguish this species very markedly from all the other species of *Brissopsis* known from the Indo-West Pacific.

BRISSOPSIS OLDHAMI Alcock

Brissopsis oldhami Alcock, Journ. Asiatic Soc. Bengal, vol. 62, p. 174, pl. 8, figs 7, 8, 1893.—A. Agassiz and H. L. Clark, Bull. Mus. Comp. Zool., vol. 50, p. 256, 1907; vol. 51, p. 136, 1907.—Koehler, Echinoderma of the Indian Museum, Echinoidea, pt. 1, Spatangidés, p. 218, pl. 14, figs. 1–3, 8, 9, 15; pl. 15, fig. 12; pl. 20, figs. 28–43, 1914.

Localities.—Station 5468, Atalayan Island (lat. 13°40′ N., long. 123°40′ E.); 1,041 meters; June 18, 1909. Two specimens, the larger

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one, 83 mm. long, in fairly good condition; the smaller, 69 mm. long, badly broken on the oral side.

Station 5582, Darval Bay, northwestern Borneo (lat. 4°20′ N., 118°59′ E.); 1,629 meters; September 26, 1909. One young specimen, 32 mm. long, and fragments of two larger ones.

Station 5602, Gulf of Tomini, Celebes (lat. 0°22′ N., long. 132°03′ E.); 1,760 meters; November 14, 1909. One young specimen, very fragmentary.

Station 5668, Macassar Strait (lat. 2°28′ S., long. 118°49′ E.); 1,649 meters; December 29, 1909. Two badly broken specimens.

Remarks.—The identification of these specimens is not quite beyond doubt. In the character of the petals they correspond very well with the illustrations given by Koehler, and the specimens in which the posterior end is sufficiently well preserved for ascertaining the character of the subanal fasciole, viz, the two specimens from station 5468 and the young specimen from station 5582, agree with Koehler's description of the species in having this fasciole very broad and in having only three tube feet to each side within the fasciole.

The two specimens from station 5468 are peculiar in that the labrum has only a very short but broad posterior prolongation, not nearly reaching to the middle of the adjoining first ambulacral plates, and carrying a few large tubercles in continuation of the tubercles of the sternum. In the specimens from station 5668 the posterior prolongation of the labrum is narrower and longer, with no larger tubercles; the same is the case in the two smaller of the specimens from station 5582, while the third resembles the specimens from station 5468 in the character of the labrum. It thus seems that the shape of the labrum varies to an unusual degree within this species.

The pedicellariae, particularly the rostrate, likewise vary to a considerable degree. In the specimens from station 5668 a very coarse form, with short broad valves, occurs in the petals; it is covered with very dark skin and has no neck, so that one might be inclined to regard it as a globiferous pedicellaria, but, rostrate forms transitional to the more usual slender type exist in other specimens. Another form of rostrate pedicellaria with unusually narrow valves is found in these same specimens. Nothing quite like these forms of rostrate pedicellariae has been observed in any of the other specimens, but forms more like the common rostrate type are found. The tridentate pedicellariae are very faintly developed in these specimens from station 5668, but in the other specimens they are well developed and of various forms, corresponding to those figured by Koehler, *op. cit.*, pl. 20. Globiferous pedicellariae, with long and slender valves terminating in two divergent teeth, as figured by Koehler, *op cit.*, pl. 20, fig. 32, are found in the specimens from stations 5668 and 5582. Ophicephalous pedicellariae not observed.

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BRISSOPSIS BENGALENSIS Koehler

Brissopsis bengalensis KOEHLER, Echinoderma of the Indian Museum, Echinoidea, pt. 1, p. 230, pl. 15, figs. 1–11; pl. 20, figs. 63, 64, 1914.

Localities.—Station 5587, Sipadan Island, northwestern Borneo (lat. 4°10′ N., long. 118°37′ E.); 759 meters; September 28, 1909. One large specimen, 85 mm. long, in a very fine state of preservation except that part of the oral side is lacking.

Station 5603, Gulf of Tomini (lat. 0°24′ N., long. 123°04′ E); 1,469 meters; November 15, 1909. One large complete specimen, 70 mm. long, one nearly complete, and two very fragmentary specimens.

Remarks.—It is of considerable zoogeographical interest that the *Albatross* found this species, hitherto known only from south of Ceylon and the Bay of Bengal, in the waters of Borneo and Celebes. It may thus be expected to be more widely distributed in the Malay region.

The identification of these specimens of *B. bengalensis* meets some difficulty, because of the fact that they have five ambulacral plates (four tube feet) reaching within the subanal fasciole, while the type would seem to have only four ambulacral plates (three tube feet) included. But a specimen from near the type locality of *bengalensis*, which I have received from the Indian Museum, has five ambulacral plates (four tube feet) within the fasciole, like the *Albatross* specimens. It would seem thus that Koehler has made some confusion of *bengalensis* and *oldhami*. That *bengalensis* should vary so much in this important character as to have sometimes four and sometimes five plates is highly improbable.

BRISSOPSIS LUZONICA (Gray)

Kleinia luzonica GRAY, Catalogue of the Recent Echinida of the British Museum, p. 49, 1855.

Brissopsis luzonica A. AGASSIZ, Revision of the Echini, p. 593, 1873.—DE MEIJERE, *Siboga* Echinoidea, p. 188, pl. 5, figs. 44, 45; pl. 23, figs. 469–476, 1904.—KOEHLER, Echinoderma of the Indian Museum, Echinoidea, pt. 1, Spatangidés, p. 207, pl. 13, fig. 16; pl. 14, figs. 4, 5, 7, 12, 13; pl. 20, figs. 51–54, 1914.—H. L. CLARK, Hawaiian and other Pacific Echini, Echinoneidae . . . Spatangidae, p. 204, pl. 152, figs. 5–8; pl. 155, figs. 2, 3, 1917; Catalogue of the Recent sea-urchins in the British Museum, p. 213, 1925.

Brissopsis duplex KOEHLER, Echinoderma of the Indian Museum, etc., p. 212, 1914.

Locality.—Station 5161, Tinakta Island (lat. 5°10′ N., long. 119°53′ E.); 29 meters; February 2, 1908. Six specimens.

Remarks.—One of these specimens is most interesting in having two different kinds of globiferous pedicellariae, viz, the form with very slender valves figured by de Meijere in his *Siboga* Echinoidea, pl. 23, fig. 474, and another form with shorter and coarser valves, but likewise terminating in two long, diverging teeth.

That Koehler's *Brissopsis duplex*, characterized by having two different kinds of ophicephalous pedicellariae, is identical with *luzon-*

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ica, as maintained by H. L. Clark, *op. cit.* 1917, cannot be doubted. The few specimens with both kinds of ophicephalous pedicellariae I have seen, among which is one of the *Albatross* specimens, differ in no other way from typical *luzonica*. On the other hand, I cannot at all agree with Clark in regarding *oldhami* and *bengalensis* as synonyms of *luzonica;* as will be set forth in volume 5 of my Monograph of the Echinoidea, I must regard these two as perfectly distinct species. On the whole, I think it beyond doubt that the *Brissopsis* "*luzonica*" of Clark's works of 1917 and 1925, as well as that of de Meijere in his *Siboga* Echinoidea, will be found, on a careful revision, to contain various species, among which no doubt will be the species here described as *Brissopsis similis*. To judge from the characters of the petals alone the several specimens of this latter species would evidently have been referred to *luzonica*, according to the literature the only species occurring in the Malay region; a careful examination of the material collected by the *Albatross* shows that no less than six different species of *Brissopsis* occur there, and of these *B. similis* appears to be the most common.

Genus EUPATAGUS L. Agassiz

EUPATAGUS RUBELLUS, new species

Locality.—Station 5158, Tinakta Island (lat. 5°12′ N., long 119°55′ E.); 22 meters; February 18, 1908. One specimen.

Type.—U.S.N.M. No. E.7157, from station 5158.

Description.—The specimen is 22 mm. long, 19 mm. broad, and 14 mm. high; probably it is not adult, though the genital pores are well developed.

The test is regularly egg-shaped, not flattened on the oral side. The vertex is a little behind the apical system. The petals are short but well formed, the posterior slightly the longer. There are 10 porepairs in the posterior series of the anterior petals, 12 in the posterior series of the posterior petals; in the anterior series of the anterior petals only the 7 distal pore-pairs are well developed, the proximal 3–4 quite rudimentary. The frontal ambulacrum almost flush with the test, with only the merest indication of a frontal depression. Phyllodes quite rudimentary. The posterior ambulacra broad, naked; plates 6–9 (10) prolonged within the subanal fasciole, so that there will probably be three tubefeet to each side within the fasciole. There are 2 or 3 large tubercles (spines) within the peripetalous fasciole to each of the paired interambulacra, none in the posterior interambulacrum. Some larger secondary tubercles to each side of the frontal ambulacrum, not arranged in regular transverse series. The plates of the aboral side otherwise rather densely covered with small secondary and miliary tubercles (spines). On the oral side the interambula-

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cral spaces narrow, in correspondence with the broad ambulacra; their tubercles not conspicuous. The labrum is prolonged posteriorly only to the end of the second adjoining ambulacral plates. The sternum is densely covered with spines throughout.

The apical system, which is slightly anterior, has four genital pores, as typical of the genus; the madreporite is not much prolonged posteriorly. The peristome is large, rounded, not at all sunken; the labrum does not form a prominent lip, the mouth opening being rather far anterior to it. The rather large periproct is close to the upper edge of the vertical posterior end of the test; it appears to be slightly sunken at its lower edge.

The primary aboral spines are all broken but apparently are about half the length of the test; they are curved basally. To judge from the part preserved they are entirely smooth. Secondary and miliary spines curved as usual; those at the posterior end longer, forming together with those of the subanal plastron a fence around the periproct. The spines of the sternum and the oral interambulacra are not widened distally.

The peripetalous fasciole is slightly sinuate in the posterior interambulacrum, straight in the posterolateral interambulacra, but bends downward at a right angle a little before the anterior petals, then disappears before reaching the frontal ambulacrum. The subanal fasciole has an anterior angle; the posterior band straight.

Pedicellariae of the tridentate, rostrate, ophicephalous, and triphyllous types, not very characteristic. Globiferous pedicellariae not observed.

The color is a light reddish on the aboral side, whitish on the oral side. The large aboral spines banded with narrow red-brown bands; also the spines of the oral side are thus banded.

Remarks.—This species appears to be the nearest related to *Eupatagus lymani* (Lambert and Thiéry) (the *Gymnopatagus pulchellus* of H. L. Clark), with which it agrees in the color. It is, however, markedly distinct from it in the labrum being much shorter; also it appears that the shape of the test is different, not so high in *lymani* as in the present species.

Genus SPATANGUS Klein

SPATANGUS sp.

Locality.—Station 5565 (lat. 5°52′ N., long. 120°30′ E.); 445 meters; September 21, 1909. One specimen.

Remarks.—The specimen is an old naked test; it was broken to pieces, but it was possible to glue the fragments together so as to form a fairly complete test.

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It is evident that this specimen is related to the Hawaiian *Spatangus paucituberculatus* A. Agassiz and H. L. Clark (cf. H. L. Clark, Hawaiian and other Pacific Echini, Echinoneidae . . . Spatangidae, p. 237, pl. 157, figs. 7–9). As in that species (and in the Mediterranean species *S. inermis* Mortensen) the paired interambulacra have no large tubercles aborally, there being only a very few larger tubercles along the midline of the posterior interambulacrum. It differs from the Hawaiian species in having the frontal depression much deeper, and the outline of the test not nearly circular, but distinctly narrowing toward the anterior end. The characters of the oral side seem to be as in *paucituberculatus* (so far as may be concluded from the description and the rather unsatisfactory fig. 9, pl. 157). There are only 2 pore-pairs to each side within the subanal fasciole.

It is quite probable that we have here a new species of the genus *Spatangus*, but in view of the deficient condition of the single specimen at hand I prefer not to name it, particularly in view of the uncertainty of the specific value of the character of the total absence of larger tubercles in the paired interambulacra. I have a couple of specimens from off Nagasaki, Japan, which would seem to be identical with *Spatangus pallidus* H. L. Clark, but here again the lateral interambulacra have no large tubercles at all. The study of the fossil forms of *Spatangus* also indicates that the character of the absence or the presence of a very few larger tubercles in the lateral interambulacra is of no great value.

Unfortunately the two Japanese specimens are likewise very incomplete, the oral side badly broken in one, totally lacking in the other specimen. A couple of specimens from the Kei Islands, likewise with larger tubercles only along the midline of the posterior interambulacrum, and very probably identical with the specimen from the *Albatross*, are also very incomplete, naked tests.

Till new, better-preserved specimens become available it must remain undecided which species of the genus *Spatangus* it is that occurs in the Malay region.

Genus MARETIA Gray

MARETIA PLANULATA (Lamarck)

Maretia planulata A. Agassiz, Revision of the Echini, pp. 140, 570, pl. 19b, figs. 7–17, 1873.—de Meijere, *Siboga* Echinoidea, p. 190, pl. 23, figs. 478, 479, 1904.—Koehler, Echinoderma of the Indian Museum, Echinoidea, pt. 1, Spatangidés, p. 106, pl. 11, figs. 18, 19; pl. 20, figs. 8–13, 1914.

Maretia ovata H. L. Clark, Hawaiian and other Pacific Echini, Echinoneidae . . . Spatangidae, p. 248, 1917; Catalogue of the Recent sea-urchins in the British Museum, p. 226, 1925.

Localities.—Tubig Bay, shore; January 7, 1908. Three specimens.

Olongapó, Luzón, beach; January 7, 1908. Many small dark specimens.

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Station 5142 (lat. 6°06′ N., long. 121°03′ E.); 38 meters; February 15, 1908. One specimen.

Station 5158 (lat. 5°12′ N., long. 119°54′ E.); 22 meters; February 21, 1908. Two specimens.

Station 5159 (lat. 5°11′50″ N., long. 119°54′ E.); 18 meters; February 21, 1908. Two specimens.

Station 5160 (lat. 5°12′40″ N., long. 119°55′ E.); 22 meters; February 22, 1908. One specimen.

Station 5161 (lat. 5°10′40″ N., long. 119°55′ E.); 22 meters; February 22, 1908. Four specimens.

Station 5342 (lat. 10°57′ N., long. 119°17′ E.); 26–46 meters; December 23, 1908. Several large specimens.

Remarks.—Ophicephalous pedicellariae, hitherto unknown in this species, are found in goodly numbers in several of the smaller specimens; they do not call for any special comment.

I must emphatically protest against H. L. Clark's changing of the species name *planulata* (Lamarck) into *ovata* (Leske). The two very poor figures of "*Spatangus ouatus*" given by Leske, Additamenta, pl. 49, figs. 12, 13, do not resemble *Maretia planulata* in the outline of the test, and in the description (p. 252, in the edition with Klein's Naturalis dispositio Echinod.) it is stated to differ from the preceding species, "*Spatangus brissoides*," a fairly large, very poorly preserved, but judged from the figure (pl. 27, B) not at all flattened, fossil spatangoid, "Testa ouata conuexa, altiore." This means that this "*Spatangus ouatus*" was at least not at all flattened, as is *Maretia planulata*. Whatever this *Spatangus ouatus* of Leske really is (it has generally been taken to be *Echinocardium flavescens;* cf. Agassiz, Revision of the Echini, p. 570), it is evident that it cannot be *Maretia planulata*, which very characteristically flattened form it would be most inappropriate to describe as "higher" than another not at all flattened form, and Clark may well be blamed for, on such exceedingly poor evidence, changing the universally used species name *planulata* (Lamarck) into *ovata* (Leske).

MARETIA CORDATA, new species

Localities.—Station 5104 (lat. 14°45′48″ N., long. 120°12′ E.); 60 meters; January 8, 1908. One young specimen.

Station 5192 (lat. 11°09′ N., long. 123°50′ E.); 59 meters; April 3, 1908. One fine specimen.

Station 5257, Mindanao (lat. 7°22′ N., long. 124°12′ E.); 51 meters; May 22, 1908. One specimen.

Station 5431 (lat. 10°38′45″ N., long. 120°12′45″ E.); 93 meters; April 8, 1909. Two specimens.

Type.—U.S.N.M. No. E.7158, from station 5192.

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Description.—The holotype is 22 mm. long, 20 mm. broad, and 8 mm. high; the specimen from station 5257 is of the same size; the other specimens are smaller; the one from station 5104, the smallest, is 13 mm. long, 11.5 mm. broad, and 6 mm. high.

From *Maretia planulata* of corresponding sizes the present species differs in being broader and also slightly higher; but particularly it differs from *planulata* in having the depression of the frontal edge of the test broader and deeper, the test being distinctly heart-shaped. On the oral side the anterior ambulacrum is conspicuously sunken, which it is not in *planulata.* The petals are a little shorter than those of *planulata* of corresponding sizes. The peristome is rounded pentagonal; the labrum, which does not form a prominent lip, reaches posteriorly to the end of the third adjoining ambulacral plates, as in *planulata.* The periproct is only about as long as broad and is nearly round in outline, whereas in *planulata* it is much longer than broad, pointed at both ends. The subanal fasciole is well developed; only two tube feet to each side within the fasciole. The long aboral spines are about equally long and numerous in both species, but somewhat slenderer in *cordata.* A very conspicuous difference between the two species is found in the basal widening of the spines of the lateral interambulacra; it is much shorter in *cordata* than in *planulata.* The pedicellariae are not markedly different from those of *planulata*, but I have found only a very small form of tridentate pedicellariae, whereas the rostrate grow to quite a fair size. The color is whitish, the type specimen with a faint tinge of reddish on the spines at the posterior end.

Probably none of the specimens at hand are adult; but genital pores are present already in the youngest of them.

EURYPATAGUS, new genus

Test low, arched: oral side flat, but sunken at the peristome. Outline elliptical, no groove or depression in the frontal edge; the posterior end slightly produced. Paired ambulacra distinctly petaloid, continuing to the edge of the test, open distally; frontal ambulacrum very narrow, the pores very small. The phyllodes of the anterior paired ambulacra very conspicuous, with 12–14 pores (tube feet) in each series, each accompanied by a sphaeridium. Peristome broad, pentagonal, rather far from the anterior edge. Labrum well developed, with a narrow posterior prolongation ending off the middle of plates No. 4 of the adjoining ambulacral series. Plastron very small, entirely naked, or at most with a very few tubercles (spines) at the posterior end. The 3 or 4 ambulacral plates adjoining the episternal plates adproctally prolonged, indicating the presence of a subanal fasciole in the young specimens; but there is no trace of such fasciole in the adults. No internal or peripetalous (or marginal) fasciole. Periproct placed vertically on the posterior end of the test, somewhat

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produced upward and visible from above. Apical system anterior; 4 genital pores. Primary tubercles of the aboral side not very conspicuous, scattered all over the interambulacra, also the posterior unpaired interambulacrum: on the sides of the test they may be distinctly arranged in horizontal series. The primary spines curved at the base, directed backward, with a few distant serrations; secondary spines curved. Tridentate, rostrate, and triphyllous pedicellariae present; but none of the globiferous type. Ophicephalous pedicellariae found in the young of one species (*paucituberculatus*). Color of test red, spines red or banded or yellowish. The denuded test white.

Genotype: *Eurypatagus ovalis*, new species.

The genus is nearly related to *Maretia* but differs from it in the open petals, the stronger development of the phyllodes, the greater posterior prolongation of the labrum, and the almost totally naked sternum. It is more nearly related to *Platybrissus*, from which it differs mainly in the character of the peristome.

EURYPATAGUS OVALIS, new species

Locality.—Station 5217 (13°20′ N., 123°14′ E.); 192 meters; April 22, 1908. Five well-preserved specimens.

Type.—U.S.N.M. No. E.7159, from station 5217.

Description.—The largest specimen is 88 mm. long, 66 mm. broad, and 26 mm. high; the smallest is 71 mm. long, 55 mm. broad, and 20 mm. high.

The above description of the genus *Eurypatagus* applies equally to the species *ovalis*; a more detailed description therefore need not be given here. A full description, with illustrations, will be given in volume 5 of the Monograph of the Echinoidea. It may be stated here only that the tridentate pedicellariae occur in two forms, a large form, up to 1.5 mm. in length of head, with very slender, slightly curved valves, wide apart, meeting only at the point, and a smaller form with broader, spoon-shaped valves. The spines are to a varying degree red-brown with lighter bands.

Genus GYMNOPATAGUS Döderlein

GYMNOPATAGUS MAGNUS A. Agassiz and H. L. Clark

Gymnopatagus magnus A. Agassiz and H. L. Clark, Bull. Mus. Comp. Zool., vol. 51, p. 133, 1907.—H. L. Clark, Hawaiian and other Pacific Echini, Echinoneidae . . . Spatangidae, p. 231, pl. 146, fig. 13; pl. 159, fig. 1, 197.

Gymnopatagus sewelli Koehler, Echinoderma of the Indian Museum, Echinoidea, pt. 1, Spatangidés, p. 98, pl. 13, figs. 1–7; pl. 19, figs. 51–60, 1914.

Localities.—Station 5332 (lat. 12°47′ N., long. 120°41′ E.); 1,363 meters; December 18, 1908. One young fragmentary specimen.

Station 5349 (lat. 10°54′ N., 118°26′ E.); 1,336 meters; December 27, 1908. Fragments of two large specimens.

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Station 5439 (lat. 15°58′ N., long. 119°40′ E.); 1,720 meters; May 9, 1909. One young badly broken specimen.

Station 5468 (lat. 13°36′ N., long. 123°40′ E.); 1,041 meters; June 18, 1909. Six large badly broken specimens, only one of them nearly complete.

Station 5612 (lat. 0°38′ S., long. 121°44′ E.); 1,373 meters; November 20, 1909. One young badly broken specimen.

Station 5619 (lat. 0°35′ N., long. 127°15′ E.); 796 meters; November 27, 1909. One young badly broken specimen.

Station 5654 (lat. 3°42′ S., long. 120°46′ E.); 1,473 meters; December 18, 1909. Fragments of two large specimens.

Station 5668 (lat. 2°28′ S., long. 118°49′ E.); 1,649 meters; December 29, 1909. One nearly complete medium-sized specimen.

Uncertain locality: Fragments of one large specimen.

Remarks.—It is very regrettable that all these specimens are very badly broken; only one specimen, a naked test from station 5468, is nearly complete. Evidently the oral side is much more fragile than the aboral side; the mud-filled, very heavy intestinal canal causes it to break by the capture in the trawl, and in most cases only small fragments or nothing at all of the oral side is preserved. In the specimen from station 5668 the anterior half of the oral side is preserved. To some degree it has been possible to glue the fragments together so as to get tolerably good aboral sides; the extremely thin fragments of oral sides it has in no case been possible to fit together.

The largest of the specimens is about 108 mm. long, but a good deal smaller than Koehler's largest specimen, which is stated to exceed 130 mm. in length. The smallest specimen (station 5332) is 50 mm. long. Genital pores are fully developed in this young specimen.

Genus PSEUDOMARETIA Koehler

PSEUDOMARETIA ALTA (A. Agassiz)

Maretia alta A. Agassiz, Revision of the Echini, p. 509, 1873.—de Loriol, Mém. Soc. Hist. Nat. Genève, vol. 28, p. 49, pl. 5, figs. 7–7e, 1883.—de Meijere, *Siboga* Echinoidea, p. 192, 1904.

Pseudomaretia alta Koehler, Echinoderma of the Indian Museum, Echinoidea, pt. 1, Spatangidés, p. 111, pl. 11, figs. 14–17, 20; pl. 20, figs. 1–7, 1914.—H. L. Clark, Hawaiian and other Pacific Echini, Echinoneidae . . . Spatangidae, p. 249, 1917; Catalogue of the Recent sea-urchins in the British Museum, p. 228, 1925.

Locality.—Station 5141, off Joló (lat. 6°09′ N., long. 120°58′ E.); 53 meters; February 15, 1908. One fine specimen, 35 mm. long.

PSEUDOMARETIA TYLOTA (H. L. Clark)

Maretia alta A. Agassiz, *Challenger* Echinoidea, pl. 33, figs. 1–4, 1881 (*non Maretia* (*Pseudomaretia*) *alta* A. Agassiz).

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Gonimaretia tylota H. L. CLARK, Hawaiian and other Pacific Echini, Echinoneidae . . . Spatangidae, p. 241, 1917; Catalogue of the Recent sea-urchins in the British Museum, p. 226, 1925.

Locality.—Station 5467, San Bernardino Strait (lat. 12°56′ N., long. 124°25′ E.); 494 meters; June 24, 1909. Three specimens, more or less broken.

Remarks.—The best-preserved specimen is 43 mm. long, therefore the largest on record; it is 35 mm. broad and 20 mm. high. Another specimen evidently was somewhat larger, but it is too fragmentary and incomplete to be measured.

The genus *Gonimaretia*, established by H. L. Clark (*op. cit.* 1917), with the species *tylota* as the genotype, is in my opinion not distinguishable from *Pseudomaretia*. It is not the place here for a discussion of this matter; it will be dealt with in my Monograph of the Echinoidea, volume 5, under the genus *Pseudomaretia*.

Genus LOVENIA Desor

LOVENIA ELONGATA (Gray)

Lovenia elongata A. AGASSIZ, Revision of the Echini, p. 575, pl. 19c, figs. 1–4, 1873.—DÖDERLEIN, Echinoiden d. deutschen Tiefsee Exped., p. 265, pl. 48, fig. 5, 1906.—KOEHLER, Echinoderma of the Indian Museum, Echinoidea, pt. 1, Spatangidés, p. 111, pl. 11, figs. 5, 6; pl. 12, fig. 10; pl. 13, fig. 8; pl. 19, figs. 25–32, 1914.—H. L. CLARK, Catalogue of the Recent sea-urchins in the British Museum, p. 230, 1925.

Localities.—Station 5160 (lat. 5°13′ N., long. 119°55′ E.); 22 meters; February 22, 1908. Two specimens.

Station 5164 (lat. 5°02′ N., long 119°52′ E.); 33 meters; February 24, 1908. Two specimens.

Station 5218 (lat. 13°11′ N., long. 123°03′ E.); 37 meters; April 22, 1908. One specimen.

Remarks.—All these specimens are young, about 25 mm. long, and not in a very good state of preservation.

LOVENIA SUBCARINATA Gray

Lovenia subcarinata GRAY, Catalogue of the Recent Echinida in the collection of the British Museum, p. 45, pl. 5, fig. 3, 1855.—A. AGASSIZ, *Challenger* Echinoidea, p. 175, pl. 35b, figs. 5–7, 1881.—KOEHLER, Echinoderma of the Indian Museum, Echinoidea, pt. 1, Spatangidés, p. 114, pl. 10, figs. 47–50, 1914.—H. L. CLARK, Hawaiian and other Pacific Echini, Echinoneidae . . . Spatangidae, p. 256, 1917; Catalogue of the Recent sea-urchins in the British Museum, p. 231, 1925.

Locality.—Station 5204, off east coast of Leyte Island (lat. 11°04′ N., long. 125°05′ E.); 27 meters; April 11, 1908. Two fine adult specimens.

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LOVENIA GREGALIS Alcock

Lovenia gregalis ALCOCK, Journ. Asiatic Soc. Bengal, vol. 62, p. 175, 1893.—DE MEIJERE, *Siboga* Echinoidea, p. 194, pl. 10, figs. 97, 98, 1904.—KOEHLER, Echinoderma of the Indian Museum, Echinoidea, pt. 1, Spatangidés, p. 115, pl. 12, figs. 6–9, 11; pl. 19, figs. 33–45, 1914.—H. L. CLARK, Hawaiian and other Pacific Echini, Echinoneidae . . . Spatangidae, p. 256, 1917; Catalogue of the Recent sea-urchins in the British Museum, p. 231, 1925.

Localities.—Station 5348, Palawan Passage (lat. 10°58′ N., long. 118°38′ E.); 686 meters; December 27, 1908. One large specimen.

Station 5646, Buton Strait (lat. 5°31′ N., long. 122°23′ E.); 834 meters; December 16, 1909. Three large specimens.

Station 5656, Gulf of Boni (lat. 3°18′ S., long. 120°37′ E.); 886 meters; December 19, 1909. Two medium-sized specimens.

Station 5657, Gulf of Boni (lat. 3°20′ S., long. 120°36′ E.); 900 meters; December 19, 1909. Three medium-sized specimens, all very badly broken.

Station 5658, Gulf of Boni (lat. 3°33′ S., long. 120°31′ E.); 933 meters; December 19, 1909. Fragments of an old test.

Remarks.—These specimens conform perfectly with the description given by Koehler, *op. cit.*, 1914; but whereas the largest of the *Investigator* specimens was 76 mm. long and the largest of the *Siboga* ones 86 mm. long, the largest of the specimens from station 5646 is 96 mm. long, the largest known till now. This specimen was denuded and has afforded a very fine preparation of the test; it will be figured in volume 5 of my Monograph of the Echinoidea.

LOVENIA TRIFORIS Koehler

Lovenia triforis KOEHLER, Echinoderma of the Indian Museum, Echinoidea, pt. 1, Spatangidés, p. 124, pl. 12, figs. 9–13, 1914.

Locality.—Station 5355, North Balabac Strait, north of Borneo (lat. 8°08′ N., long. 117°19′ E.); 81 meters; January 5, 1908. One specimen.

Remarks.—This species was hitherto known only from the single incomplete specimen taken by the *Investigator* in the Gulf of Martaban. Later (1914) I took one specimen near the Goto Islands, Japan, and (1929) a few specimens in the Bali Sea, all except one very badly broken. The specimen from the *Albatross* is in fairly good condition, the test not broken; it is 33 mm. long.

The rostrate pedicellariae, the only type of pedicellariae found on this specimen, differ from those of the specimens from the Bali Sea in being smooth, whereas they are more or less conspicuously knobbed in the Bali Sea specimens. Since, however, there are no other differences, and all other characters are identical, and, moreover, only quite small examples of these rostrate pedicellariae are found, I can have no doubt that this specimen from off North Borneo is conspecific with

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those from the Bali Sea. The species *L. triforis* is thus now known to be distributed from the Bay of Bengal to Japan, and must be supposed to have its center of distribution in the Malay region.

LOVENIA DÖDERLEINI Mortensen ACUMINATA, new variety

Localities.—Station 5161, Tinakta Island, Tawi Tawi Group (lat. 5°10′ N., long. 119°53′ E.); 29 meters; February 21, 1908. One specimen.

Station 5164, Tawi Tawi Group (lat. 5°02′ N., long. 119°52′ E.); 33 meters; February 24, 1908. One specimen.

Type.—U.S.N.M. No. E.7160, from station 5161.

Description.—The type specimen is well preserved, 32 mm. long, 26 mm. broad, and 14 mm. high. The other specimen is smaller, 25 mm. long, also well preserved.

This form differs from typical *L. döderleini*, which will be described in volume 5 of my Monograph of the Echinoidea, in being markedly attenuated posteriorly (particularly the large specimen). Further, it differs in having the internal fasciole single anteriorly (double in the typical *döderleini*), and in having the stalk of the globiferous pedicellariae thin, not at all thickened as it is in the typical *döderleini;* these pedicellariae are found only in the type. That ophicephalous pedicellariae are wanting is probably not a constant character, since they are not always present in typical *döderleini.* In all the other characters these specimens agree with typical *döderleini* (apart from the fact that the aboral globiferous pedicellariae so characteristic of that species are not found).

It is quite probable that these specimens actually represent a distinct new species; but with the quite insufficient material at hand I do not think it advisable to establish it as more than a variety of *L. döderleini*, with which it is at any rate very closely allied.

Genus BREYNIA Desor

BREYNIA ELEGANS Mortensen

Locality.—Station 5152, near the Tawi-Tawi Islands (lat. 5° 23′ N., long. 120°16′ E.); 62 meters; February 18, 1908.

One specimen, a very badly broken, incomplete test. The fragments could be fitted together so as to form a tolerable specimen, 95 mm. long, 73 mm. broad, and 36 mm. high.

Remarks.—Though in poor condition, this specimen can be identified with certainty as belonging to the new species *B. elegans*, established for a large specimen from the Kei Islands, also rather badly broken, but still in much better condition than the specimen from the *Albatross*, particularly in that the spines are preserved. It was thus necessary to take the specimen from the Kei Islands as the

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type, and I must refer to the description of the species which will be given in volume 5 of my Monograph of the Echinoidea. It must suffice here to state that the species is characterized by its unusually low test, the numerous primary aboral tubercles (spines), and the very uniform fine granulation of the aboral side. The oral side is flat, not at all sunken toward the peristome. The labrum has a narrow posterior prolongation, reaching almost to the end of the third plate of the adjoining ambulacra. The sternum is tuberculated only in its posterior part. The primary spines are banded with narrow purplish bands.

Genus BRISSUS Klein

BRISSUS LATECARINATUS (Leske)

Brissus carinatus A. Agassiz, Revision of the Echini, p. 596, pl. 21a, figs. 1–3, 1873.

Brissus latecarinatus H. L. Clark, Hawaiian and other Pacific Echini, Echinoneidae . . . Spatangidae, p. 219, pl. 146, fig. 15, 1917; Catalogue of the Recent sea-urchins in the British Museum, p. 219, 1925.

Locality.—Catbalogan, Sámar, shore; April 16, 1908. One young specimen.

Genus METALIA Gray

METALIA STERNALIS (Lamarck)

Metalia sternalis A. Agassiz, Revision of the Echini, p. 600, pl. 21a, figs. 4, 5; pl. 21c, figs. 5–9, 1873.—H. L. Clark, Hawaiian and other Pacific Echini, Echinoneidae . . . Spatangidae, p. 209, pl. 146, fig. 30, 1917; Catalogue of the Recent sea-urchins in the British Museum, p. 216, 1925.

Locality.—Station 5159, Tinakta Island, Tawi Tawi Group (lat. 5°12′ N., long. 119°54′ E.); 18 meters; February 21, 1908. One medium-sized specimen, 40 mm. long.

The specimen has only five tube feet to each side within the subanal plastron, as against nine or ten in adult specimens.

METALIA SPATAGUS (Linnaeus)

Metalia maculosa A. Agassiz, Revision of the Echini, p. 598, pl. 21b, figs. 8, 9, 1873.

Metalia spatagus Lovén, Bihang Svenska Vet.-Akad. Handl., ser. 13, vol. 4, No. 5, p. 162, pl. 6, fig. 1, 1887.—H. L. Clark, Hawaiian and other Pacific Echini, Echinoneidae . . . Spatangidae, p. 210, 1917; Catalogue of the Recent sea-urchins in the British Museum, p. 216, 1925.

Locality.—Station 5160, Tinakta Island, Tawi Tawi Group (lat. 5°12′40″ N., long. 119°55′ E.); 22 meters; February 22, 1908. One young specimen, 20 mm. long.

Remarks.—This specimen has already the genital pores fully developed. The subanal fasciole is very distinct; there are three tube

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feet to each side within the subanal plastron, but the fact that the ambulacral plate No. 10 reaches within the fasciole proves that there would have been 4 tube feet enclosed in a later stage.

It is rather surprising to find the genital pores fully developed already at such young age, as it is otherwise a general rule that in species attaining a large size (as does *M. spatagus;* it exceeds a length of 100 mm.) genital pores are rather late in appearing. I am then not altogether sure that it may not ultimately be found that this young specimen (and I have similar specimens of the same size from Mauritius) represents another species, related to *M. spatagus;* also Clark (1925) finds such young specimens perplexing. I have, however, no specimens of intermediate sizes and must therefore for the present content myself with referring these young specimens to *Metalia spatagus.*

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Bulletin 100

VOLUME 14, PART 4

CONTRIBUTIONS TO THE BIOLOGY OF THE PHILIPPINE ARCHIPELAGO AND ADJACENT REGIONS

COPEPODS GATHERED BY THE UNITED STATES FISHERIES STEAMER "ALBATROSS" FROM 1887 TO 1909, CHIEFLY IN THE PACIFIC OCEAN

BY

CHARLES BRANCH WILSON

INDIANA UNIVERSITY

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FOREWORD

Dr. Charles Branch Wilson, author of this work, died on August 18, 1941. A brief obituary was published in Science, volume 94, pages 358–359, October 17, 1941. More intimate biographical notes formed a memorial supplement to the Westfield, Mass., High School Herald, volume 54, No. 1, October 17, 1941; the subject of an obituary note in The Colby Alumnus, volume 31, No. 2, pages 21–22, November 15, 1941; and a biographical note in the National Cyclopedia of American Biography, by Dr. Wilson's son, Carroll A. Wilson.

Inasmuch as the manuscript of this paper was not given editorial attention while Dr. Wilson was still living, special pains have been taken to check references, occurrences, station records, and lists of species collected. In this task I was assisted by Miss Lucile McCain, of the office of the head curator of zoology, United States National Museum, who also prepared the list of literature cited; by Mrs. Mildred S. Wilson,[1] formerly assistant curator of the Museum's division of marine invertebrates, who checked parts of the collection and verified certain identifications; and by Miss Gladys O. Visel, of the editorial division of the Smithsonian Institution. Such notes, emendations, and corrections as I have made, other than this foreword, are generally followed by the initials W. L. S. and are usually enclosed in brackets. Notes supplied by Mrs. Wilson have been similarly dealt with and are initialed M. S. W. Mrs. Wilson also contributed the references made to two important works by R. B. Seymour Sewell (1913; 1929, 1932) dealing with the copepod fauna of the Indian seas that apparently escaped Dr. Wilson's attention. Sewell anticipated several of Dr. Wilson's first Pacific records for certain Atlantic species.

The manuscript as received from Dr. Wilson contained no references to original descriptions of species or a list of literature cited. These omissions were supplied here at the National Museum. Besides preparing the "Literature Cited," Miss McCain checked the citations against the original publications in every instance where these were obtainable in this country.

Because of their pertinency, Dr. Wilson included his identifications of the copepods from several Pacific stations occupied by Alexander Agassiz in November and December 1897, while cruising through the Fiji Islands aboard the *Yaralla* (*cf.* List of Copepods Collected, p. 429). Also included are two species not collected by the *Albatross*, as well as non-*Albatross* material of a third species that Dr. Wilson

[1] Mrs. Charles Sawyer Wilson, not related to Dr. Charles Branch Wilson.

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found expedient to publish in this report. The first two are *Acartia tumida* Willey (p. 155) and *Tigriopus incertus* Smirnov (p. 344); the third is *Augaptilus glacialis* Sars (p. 170). Figures 311–316 and 318–322 (pl. 22), together with the accompanying text, have been omitted, for while they represent two species of fresh-water copepods collected by Dr. Wilson they are not properly part of this report on marine plankton, nor are they a part of the *Albatross* collections. Figures 18, 19, 20, 205, 206, 222, 266, 270, 420, 440, 444, 489, and 538, were found to be incorrect in certain particulars, and a few of these have been deleted. Seven species, represented among unrecorded lots of material that Dr. Wilson had determined and labeled, for some reason failed of mention in the text of his manuscript. These are entered in alphabetical sequence in the discussion of the species, together with the number of the station from which he recorded them and bracketed comment. They are, with the National Museum catalog numbers, the following: *Bradyidius-armatus* (78848), *Drepanopus forcipatus* (79441), *Haloptilus bulliceps* (73928), *Lubbockia brevis* (73970), *Metridia macrura* (74391), *Ratania flava* (74107), and *Tortanus recticauda* (78844).

Twenty-six stations with their accompanying lists of species identified were removed from the manuscript, as the stations were cited by number only and it was not possible to assign them to the proper D. or H. series in the absence of the original field labels, which apparently were not retained when the plankton samples were sorted. The species identified from these particular stations, though not published, are available in the catalogs and reference files of the Division of Marine Invertebrates, United States National Museum. The numbers of these stations are: 101, 136, 1870, 1919, 2369, 2374, 2456, 2750, 2763, 2796, 2928, 2939, 3195, 3587, 3594, 3596, 3597, 3599, 3621, 3628, 3710, 3790, 3827, 3857, 3869, 3986.

Of 15 species discussed in the text no specimens appear to have been saved or segregated by Dr. Wilson. They are:

Amallothrix arcuata
Centropages bradyi
Disseta maxima
Euaugaptilus rigidus
Farrania oblonga
Gaetanus inermis
Metridia gerlachei
Pareuchaeta exigua
Pontella cerami
Pontellopsis bitumida
Pseudochirella divaricata
Sapphirina sinuicauda
Scaphocalanus angulifrons, male
Scaphocalanus robustus
Scolecithricella minor

In Dr. Wilson's report on "The Copepods of the Plankton Gathered during the Last Cruise of the *Carnegie*" (Carnegie Inst. Washington Publ. 536, p. 176, 1942), W. A. Gosline, of Stanford University, noticed that Wilson's new generic name *Carnegiella* had been used some years

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before by Eigenmann (Ann. Carnegie Mus., vol. 6, No. 1, p. 13, 1909) for a new genus of fish. I here propose **Carnegietta**, genotype *C. gracilis* (Wilson), for the preoccupied genus, in order to carry out Dr. Wilson's manifest desire so to honor the late Andrew Carnegie, generous patron of science.

All Dr. Wilson's records and his extensive library of copepod literature were bequeathed to the Division of Marine Invertebrates, United States National Museum, Washington, D. C. It is hoped that the recipients of this posthumous work of Dr. Wilson's will continue to contribute all publications of their own dealing with copepods or marine biology to the Wilson library at the National Museum, in order that it may be made as complete as possible.

WALDO L. SCHMITT,
Head Curator, Department of Zoology
U. S. National Museum

JUNE 1949.

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COPEPODS GATHERED BY THE UNITED STATES FISHERIES STEAMER "ALBATROSS" FROM 1887 TO 1909, CHIEFLY IN THE PACIFIC OCEAN

By Charles Branch Wilson

INTRODUCTION

The United States Fisheries steamer *Albatross* made her first voyage in 1883. The vessel was designed chiefly for the investigation of fisheries and fishing grounds, and in connection with this work it did a great deal of dredging and tow-netting. Thus large collections of the oceanic fauna and flora were gradually accumulated, some of which were submitted to various specialists for identification and report, while others were stored for future study. The latter was the fate of the copepods, which remained unidentified except for the few Atlantic species that were studied by Richard Rathbun, who gave special attention to their colors when alive. These Atlantic forms, together with Rathbun's valuable notes upon them, were incorporated in the present author's report upon the copepods of the Woods Hole region, published in 1932 as Bulletin 158 of the United States National Museum.

The present paper contains the remainder of the copepods which were gathered chiefly during the following voyages of the *Albatross:* (1) A voyage around South America and up the eastern Pacific, 1887 to 1888; (2) voyages across the tropical Pacific to Japan and Kamchatka, 1899 to 1901; (3) a cruise among the Hawaiian Islands in 1902; (4) collecting from California southward in the eastern Pacific in 1904; (5) investigations in connection with the Alaskan salmon fisheries in 1903 and again in 1905; (6) a voyage through the northwestern Pacific in 1906; and (7) a 3-year cruise among the Philippine Islands, 1907 to 1910, which yielded the greatest number of specimens.

No effort was made to deal with the copepods during these two decades, and by 1911 the numbers had reached formidable proportions. Most of those taken in the first six of the above voyages and a very few from the seventh were then sent to Dr. Georg Ossian Sars in Norway for identification and report. He isolated and labeled about two-fifths of the collection, listed the stations at which the species

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he identified were found, and made a number of more or less complete pencil sketches, especially of the species he considered new. But he wrote no descriptions of his new species and did not compile notes of any kind. He then ceased work upon the *Albatross* collection and turned back to the completion of a report he had previously begun upon the copepods of the plankton collected during the scientific expeditions of the Prince of Monaco. A preliminary list of the species in this Monaco plankton had appeared in two bulletins of the Monaco Oceanographic Museum in 1905, with brief descriptions of the new genera and species, but no figures. The completed monograph was published in 1925, preceded during the previous year by an atlas of plates (see p. 144).

That Sars' work upon the *Albatross* collection followed his preliminary list of the Monaco copepods and preceded the publication of his final monograph is seen in the following facts: When the *Albatross* copepods finally came into possession of the present author many of the vials contained labels in Sars' handwriting. In numerous instances the generic and specific names on these labels corresponded exactly with those given in the Monaco preliminary list, though the latter were entirely changed in the final monograph. In fact, some of the changes were made after the publication of the plates and prior to the appearance of the text, so that we find a copepod figured under one name in the plates and described under a very different name in the text.

For some reason Sars never resumed work upon the *Albatross* copepods, and after his death [in 1927] the entire collection was returned to the United States National Museum, together with Sars' identifications, pencil sketches, and records of stations, which were courteously made available by the Oslo Museum. All these were then submitted to the present author for verification of the species already identified, completion of the identification, listing, and recording of the collection, and descriptions of the new species. The present report is the result of these labors.

COMPLETION OF SPECIFIC CHARACTERS

It often happens that a plankton sample yields but a single sex, more rarely a single specimen upon which to establish a new species. If the types are females the new species may at once be accepted as valid, since the female in marine copepods, wherever possible, is selected as the primary, or holotype. Such species, though valid, are incomplete, since the male characters of the species are lacking. In species based on the male alone there is always the possibility that the type may prove eventually to be the missing sex of a species described from the

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female only, rather than the representative of a species altogether new. Sometimes there seems to be an exceptional dearth of males, as in the Monaco plankton, from which more than 100 species were described from females alone.

The *Albatross* plankton contributes the missing opposite sex of the following 26 species already described:

Acartia laxa Dana, male.
Acartia tumida Willey, male.
Disseta scopularis (Brady), female.
Euaetideus bradyi (A. Scott), male.
Euchaeta longicornis Giesbrecht, male.
Euchaeta media Giesbrecht, male.
Euchaeta pubera Sars, male.
Euchirella bitumida With, adult male.
Euchirella galeata Giesbrecht, male.
Lophothrix humilifrons Sars, male.
Lophothrix latipes (T. Scott), male.
Macandrewella chelipes (Giesbrecht), female.
Macandrewella sewelli Farran, male.
Pareuchaeta californica (Esterly), male
Pareuchaeta erebi Farran, male.
Pareuchaeta grandiremis (Giesbrecht), male.
Pareuchaeta rasa Farran, male.
Phyllopus aequalis Sars, male.
Phyllopus giesbrechti A. Scott, male.
Sapphirina longifurca A. Scott, male.
Scaphocalanus angulifrons Sars, male.
Scaphocalanus echinatus (Farran), male.
Scaphocalanus medius (Sars), male.
Scolecithricella auropecten (Giesbrecht), male.
Scolecithricella dentata (Giesbrecht), male.
Scottocalanus helenae (Lubbock), female.

In dealing with the new species the names proposed by Sars for the species he regarded as new have been retained as far as possible. Some that were new at the time he made the drawings have since been described by later investigators, to whom of course they must be credited. But many of the drawings made by Sars are worthy of publication, since their wealth of detail fully establishes species that had been left questionable by reason of meager description and poor figures. Sars, however, left no manuscript of any sort, and therefore the descriptions, the measurements, and the remarks belong entirely to the present author. A list of the new species described in this paper is given on page 351.

OTHER COMPARABLE COLLECTIONS

In order to obtain a better conception of general plankton distribution than can be obtained from any single record, comparisons are drawn with five other plankton lists of special importance not only for their great intrinsic value, but also because they are among the most comprehensive lists that have thus far appeared and because they cover much the same areas as those traversed by the *Albatross*. These lists or reports may be characterized briefly in the order of their appearance.

1. Dana, James Dwight. Crustacea [of the] United States Exploring Expedition during the years 1838 to 1842, under the command of

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Charles Wilkes, U. S. N. Published in 1853 as volume 14, part 2, of the Report on the Expedition, followed by a folio Atlas of Plates in 1855. This was the first scientific expedition sent out by the United States Government and forms an appropriate prelude to the subsequent explorations of the *Albatross*. One hundred seventy-one species of copepods, including free-swimming, parasitic, semiparasitic, and commensal species, are reported on. Dana served as a member of this expedition and thus had an opportunity to study the copepods while they were alive, as well as after preservation. He is the only author so privileged, and this gives his observations upon the color of the living copepods special value. At least 50 of his species are here reported from almost identical localities after the lapse of a century.

2. Brady, George Stewardson. Report on the Copepoda collected by H. M. S. *Challenger* during the years 1873 to 1876. Published in 1883 as volume 8, part 23, of the Report on the Expedition. This work treats 106 species and includes parasitic and commensal as well as free-swimming forms. It is probably the most widely known copepod list and the one to which reference is most frequently made.

3. Scott, Andrew. The Copepoda of the *Siboga* Expedition in the Dutch East Indies during the years 1899 to 1900. Published in 1909 as monograph 29a, part 1, of the Report on the Expedition. Includes accounts of 338 species of littoral, free-swimming, and semiparasitic copepods and contains a very full and valuable synonymy and distribution. The accompanying plates also give many details of structure not found elsewhere.

4a. Sars, Georg Ossian. Copépodes particulièrement bathypélagiques. Published as fascicle 69 of the Résultats des Campagnes Scientifiques accomplies sur son Yacht par Albert I[er] Prince Souverain de Monaco. The Atlas of Plates appeared in October 1924, the text in December 1925.

4b. Rose, Maurice. Copépodes pélagiques particulièrement de surface. Published in 1929 as fascicle 78 of the same Résultats.

The two preceding Monaco lists (4a and 4b) are supplemental, and, for purposes of discussion, have been considered as constituting a single list. The former contains 297 deep-water species and the latter 132 surface and shallow-water species. Eighty-one species appear in both lists, thus reducing the total Monaco plankton to 348 species, all of which are free-swimming.

5. Wilson, Charles Branch. The copepods of the plankton gathered during the last cruise of the *Carnegie*. [Published posthumously in Carnegie Institution of Washington Publication 536, 1942. Dr. Wilson's discussions of the *Carnegie* plankton refer to his at the time unpublished manuscript.—W. L. S.] In collecting this plankton, nets of bolting silk 1 meter in diameter at the mouth

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and several meters long were employed. Three tows were made simultaneously at each station, one at the surface, one at a depth of 50 meters, and the third at a depth of 100 meters. The tows at successive stations were made at the same time of day by the same operator, using the same nets and the same methods. Furthermore, the temperature, salinity, density, and phosphates were recorded for every tow. This method makes the records especially useful for comparison and furnishes valuable data for establishing the reactions of various copepod species to light, temperature, and salinity.

SYSTEMATIC REFERENCES

Since this is essentially a record of the copepod species found in the plankton and in no sense a systematic treatise, it seems preferable to arrange the species in alphabetical order without reference to families. The synonymy of the different species is so fully published in the *Siboga* and Monaco lists that there is no need for presenting it here [only the reference to the original description is given under each species name, except for species amplified by Dana, Giesbrecht, and Sars in their larger monographs (1853–1855, 1892, and 1925 respectively), to which works reference is also made].

Very nearly all the copepod species named in this paper may be found in one of the plankton lists just referred to. The systematic position and synonymy may be still further defined by reference to one of the following works:

1892. Giesbrecht, Wilhelm. Systematik und Faunistik der pelagischen Copepoden des Golfes von Neapel und der angrenzenden Meeresabschnitte. Fauna und Flora des Golfes von Neapel, monogr. 19.

1911. Wolfenden, Richard Norris. Die marinen Copepoden: 2, Die pelagischen Copepoden der Westwinddrift und des südlichen Eismeers. Mit Beschreibung mehrerer neuer Arten aus dem atlantischen Ozean. Deutsche Südpolar-Expedition, 1901–1903, vol. 12, Zoology, vol. 4, fasc. 4.

1915. With, Carl. Copepoda I. Calanoida Amphascandria. Danish Ingolf-Expedition, vol. 3, pt. 4.

1929. Farran, G. P. Crustacea, pt. 10, Copepoda. British Antarctic (*Terra Nova*) Expedition, 1910. Nat. Hist. Rep., Zool., vol. 8, No. 3.

1929, 1932. Sewell, R. B. Seymour. The Copepoda of Indian Seas. Calanoida. Mem. Indian Mus., vol. 10, pp. 1–221, 81 figs., 1929; pp. 223–407, figs. 82–131, 6 pls., 1932.

1932. Wilson, Charles Branch. The copepods of the Woods Hole region, Massachusetts. U. S. Nat. Mus. Bull. 158.

1933. Rose, Maurice. Copépodes pélagiques. Faune de France, No. 26.

The last two references contain keys to the various genera and species and outline-drawings of the distinctive characters of every species included.

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THE NUMBER OF SPECIES

As here identified, the present record contains 472 valid species (plus 1 copepodid larva of *Pennella*), of which 29 are new to science. Such a large number of species would naturally be expected when the size of the *Albatross* collections is taken into consideration. When the number of tow-nettings runs into the thousands the number of species might well reach into the hundreds. A few parasitic species have been included because when captured they were swimming freely and formed as integral a part of the plankton as any of the other species. In addition, the *Albatross* during the voyages here recorded obtained many other parasitic species taken from their respective hosts. These have been fully described and figured in papers dealing with the parasitic copepods that have appeared under the author's name in the Proceedings of the United States National Museum.

NETS AND METHODS OF COLLECTING

Various sizes of nets were used in collecting the *Albatross* plankton. The commonly used surface tow nets of the earlier days of the *Albatross* were rigged on rings 12 to 18 inches in diameter, but larger nets with rings from 4 to 5½ feet in diameter were also frequently employed. From 1891 through 1895, and more rarely in later years, intermediate tows were usually accomplished with closing nets of two types—the Tanner net of about 2½ feet in diameter, and the Townsend net of 3 feet in diameter. Beginning with 1904 the smaller tow nets were Kofoid nets of three styles rigged on rings ranging from 12 inches to 2 feet in diameter. These were used separately, at times in tandem or series, and occasionally in conjunction with larger open surface and vertical nets of four different styles. The intermediate nets of these days were, almost without exception, of the open type and of two sizes, 4 and 5½ feet in diameter. During the Philippine cruise, 1907–10, six styles of Kofoid nets were used. All six were suspended from 14-inch rings, the standard of that time. There were also three styles of open intermediate nets with rings either 5½ or 10 feet in diameter, as well as an open plankton net fastened to a 2-foot ring.

Surface tows were drawn horizontally immediately, or a little, below the surface for varying times and distances. Less often were vertical hauls made from various depths to the surface. More rarely were plankton nets drawn horizontally at a given distance below the surface and then diagonally to the surface. Except in the early days, when one or another type of closing net was used, the horizontal tows became virtually a combination horizontal-vertical haul which, how-

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ever, did afford a greater opportunity for the inclusion of the species frequenting the horizontal part of the tow.

Regrettably, vertical tows with open nets give no idea of the depth at which various specimens entered the net. An electric light was used to lure the plankton on enough occasions to warrant the conclusion that it adds to the number of copepods captured.

[Descriptions of the several nets and pertinent physical station data will be found in the dredging and hydrographic records published for each *Albatross* cruise by the U. S. Fish Commission, later U. S. Bureau of Fisheries. These publications are cited on pages 352, 358, 360, 364, 423 in footnotes accompanying the "Lists of copepods collected, arranged by stations."—W. L. S.]

GENERAL CONCLUSIONS

Although the time of day, the temperature of the water, and the duration of the haul were recorded for each towing in the original *Albatross* dredging and hydrographic records, there was never any agreement between successive hauls except in temperature. Extensive comparison of the different hauls is therefore impossible and thus the number of species obtained would have little significance. Generally, the number has not been discussed in the text or entered in the lists of copepods collected. A study of the lists of species collected, however, together with a review of the station records, emphasizes some facts worthy of consideration and permits some comparisons of interest with plankton lists of other expeditions.

The first impression is one of great irregularity of distribution. The samples of plankton from 29 stations examined by the author contained no copepods. At each of some 100 other stations there was but a single species and sometimes only a single specimen. Otherwise, anywhere from 2 to 100 or more species were obtained at each station. Conversely, approximately 90 species were each confined to a single station, while the number of stations from which other species were recorded ranged from 2 to 50 or more. There were even greater differences in the number of specimens obtained at the stations. Some hauls yielded but two or three individuals, while in others the number often ran into hundreds and even thousands of specimens.

The time of day most favorable to a large catch is late in the afternoon or early in the evening.

While a horizontal surface tow nearly always yields a larger number of specimens and a greater variety of species, there are still left quite a large number of species that appear only in vertical tows from various depths. By increasing the duration of a tow, an addition to its volume will be practically certain to result, but the increment is

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never in exact proportion to the duration. For example, doubling the duration will produce neither twice as many species nor twice the number of specimens.

The plankton taken at stations 33 to 63, in the southern part of Bering Sea, among and north of the Aleutian Islands, furnishes interesting information. The copepod species recorded in these tows include many that are usually found considerably farther south. Species of *Corycaeus*, *Farranula*, *Sapphirina*, and *Undinula* are ordinarily regarded as at least subtropical in distribution. Their presence so far north suggests that the Japan Current, like the corresponding Gulf Stream in the Atlantic, transports plankton in the middle of summer far beyond its normal habitat. This has been recorded many times at Woods Hole, Mass., in connection with the Gulf Stream, and these copepod records testify to the same thing in connection with the Japan Current.

Certain associations or companionships may be noted also among the different species. We naturally expect the various species of the same genus to be associated, since the environment favorable to one of them might be assumed to be favorable to all. The species of such genera as *Candacia*, *Corycaeus*, *Eucalanus*, *Euchirella*, *Labidocera*, *Lucicutia*, *Oncaea*, *Pontellopsis*, and *Sapphirina*, as well as many others, naturally swarm together in the plankton as a result of their relationship. Then there are also generic as well as specific companionships, genera that are so often found together in the same tow as to suggest a sort of Damon and Pythias friendship. Such genera as *Undinula*, *Euchaeta*, *Metridia*, and *Acrocalanus* are often found together, sometimes in large numbers. The surface tow at station 4009 contained a solid pint of copepods, made up entirely of *Undinula vulgaris*, *Euchaeta marina*, and *Acrocalanus gracilis*, and this grouping was repeated at a number of other stations. Why should not such an association suggest a closer relationship between these genera than is usually accorded them? Such a discussion of interrelations would afford a welcome relief from the harshness of stressing generic distinction.

The five plankton lists of the Wilkes (Dana), *Challenger* (Brady), *Siboga* (A. Scott), Monaco (Sars, Rose), and *Carnegie*[2] (Wilson) expeditions listed on pages 143–145 were chosen for comparison with the results of the *Albatross* expeditions as here transcribed. They are the largest records covering in whole or in part the areas traversed by the *Albatross*. Hence such a comparison will give us at least a partial intimation of the changes that have taken place in the copepod content of the plankton during three-quarters of a century. Of

[2] [At the time Dr. Wilson discussed this list it was still in manuscript.—W. L. S.]

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course, the kind of nets employed and the methods used in collecting the plankton have changed considerably, but the results obtained present certain facts and considerations of great interest.

Of the 472 valid species enumerated in the present report, 12 appear in all five of the compared lists, 30 are present in four of the lists, 79 in three of them, 114 in two of them, and 145 in at least one of them. This leaves 93 species found only in the *Albatross* plankton, of which 29 are new to science. The 12 present in all the lists may reasonably be regarded as the most widely distributed and the most stable of the plankton copepods. It sometimes happens that one of these species runs amuck at breeding and comes to constitute practically the entire bulk of the plankton over a considerable area. *Anomalocera patersoni*, *Calanus finmarchicus*, *Euchaeta marina*, and *Undinula vulgaris* often swarm in sufficient numbers to color the sea in which they are swimming.

On the other hand, the 93 species confined to the *Albatross* plankton constitute just about 19 percent of the total number of species taken by the *Albatross* and may be regarded as the least widely distributed and the most transitory of the copepod species in the plankton. They do not occur in large numbers, usually two or three specimens in a given locality. With the preceding group, they form one of two plankton extremes; together they include a little more than one-fifth of the entire number of species.

For the bulk of the plankton the superabundance mentioned above is generally temporary, soon disappearing, while the members of this last group or extreme never reach sufficient numbers to make them worthy of more than honorable mention. It is, therefore, the remainder, approximately four-fifths of the whole number of species, that contributes most to the maintenance of the general average of the plankton. Conversely, the two groups forming the extremes of abundance are chiefly responsible for the inequalities noted in the plankton at different times and in different localities.

Seventy percent[3] of all the *Albatross* plankton was taken in horizontal tows at the surface, and the same is true of 73 percent of the *Siboga* plankton. In the Monaco plankton 64 percent of the collections studied by Sars came from the surface, and of the 512 collections examined by Rose only 9 were taken below the surface. In the Wilkes and *Challenger* expeditions no depth statistics are given, but Brady's report begins with this sentence, "The copepods noticed in this report were taken almost entirely from surface-net gatherings made during

[3] [The percentages given, as well as the statistical remarks made here and elsewhere in the report, are in the main correct. It is not believed that the few species added to the manuscript or that the several stations omitted will make any appreciable difference in Dr. Wilson's conclusions.—W. L. S.]

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the cruise." The same is true of the Wilkes plankton, although the statement does not appear in Dana's record. In the *Carnegie* expedition three horizontal tows were taken at each station, one at the surface, one at a depth of 50 meters, and the third at a depth of 100 meters (only one vertical haul, from 1,000 fathoms to the surface, was made during the entire cruise). Our knowledge of the oceanic plankton, therefore, is almost entirely confined to what is found at the surface, and we know practically nothing of the copepods living in the depths.

The excellent Monaco monograph by Sars (*cf.* p. 144) bears the title "Copépodes particulièrement bathypélagiques." This could well be taken as contradictory unless it be explained that the vertical hauls (36 percent) yielded four times as much plankton as the surface tows (64 percent), with a very pronounced superiority in the variety of species. Lacking devices by which the nets employed could be opened just before a vertical haul was made and be closed immediately upon its completion, the nets would of course function as open nets while being lowered to the required depth, in the course of their upward passage for the duration of the haul, as well as up to and including the surface itself. Thus the depth at which any specimen entered the net can never be established. The mere presence of a particular species within a net after a vertical haul would not be evidence that it is bathypelagic. Only if it is found in several vertical hauls and not at all in the surface tows could negative evidence be claimed. It is upon such evidence, which is excellent as long as it remains true, that the Monaco specimens were claimed to be bathypelagic. But there is always a menace to such negative proof in the possible future discovery in surface tows of a species declared to be bathypelagic (cf. *Gaetanus miles*, p. 232).

As to the relative abundance of the copepod plankton at the surface or in the depths we find much interesting evidence. In the *Siboga* plankton 65 surface tows captured an average of 35 species apiece, while 15 vertical hauls averaged 69.1 species, and one of them yielded 131 species. In the Monaco plankton 76 of the surface tows yielded but a single species apiece, and for the whole 210 tows the average was only 3.60 species. On the other hand, the 136 vertical hauls contained an average of 21.70 species and one of them yielded 84 species. In the *Carnegie* plankton, with one exception, there were no vertical hauls, but simultaneous horizontal tows were taken at three depths with a slight difference in favor of the deepest tow. In the *Albatross* plankton 152 surface tows contained an average of 16 species, while 130 vertical tows yielded an average of 20 species.

So much then for the past and the present of the plankton through nearly a hundred years, and now what of the future? A good start

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has been made toward a knowledge of the surface plankton, but it is only a start, and a broad field is still left for future investigation and discovery. Many species have been obtained in vertical hauls from considerable depths, but we have absolutely no definite knowledge as to where they entered the net. Before any real knowledge of depth distribution can be obtained there must be a series of horizontal tows made at different depths with a net capable of being closed while being lowered, opened as the tow is being made, and closed again while it is being raised to the surface. A series of such tows and only such will give us the definite knowledge required for further study of the deep-water forms.

THE SPECIES COLLECTED

In order that credit may fall where it is properly due, the name of the author follows each of the new species. The species followed by "Sars MS." are based on the very excellent drawings that Dr. Sars made of them. As he left no written notes, I have supplied the necessary diagnostic descriptions.[4]

Genus ACARTIA Dana, 1846

ACARTIA CLAUSII Giesbrecht

Acartia clausii GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 5, sem. 2, p. 25, 1889; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 507, 522, pl. 30, figs. 2, 6, 9, 13–15, 17, 28, 36, 37; pl. 31, figs. 36, 37; pl. 42, fig. 32; pl. 43, figs. 3, 5, 14, 1892.

Stations 39; 70; 4756; 4785. This species appeared in all the plankton collections except that of the *Siboga* Expedition. It is fairly well distributed, but nowhere is it abundant.

ACARTIA DANAE Giesbrecht

Acartia danae GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 5, sem. 2, p. 26, 1889; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 508, 522, pl. 30, figs. 1, 23; pl. 43, fig. 8, 1892.

Stations 15; 24; 31; 34; 36; 39; 41; 44; 46; 47; 49; 51; 52–55; 57; 59; 60; 62–67; 70; 71; 73; 77; 470; 3799; 3829; 3878; 3901; 4009; 4011; 4037; 4673; 4756; 4952; 5102; 5120; 5125; 5133; 5134; 5155; 5175; 5176; 5180; 5185; 5190; 5196; 5208; 5209; 5223; 5226; 5227; 5230–5234; 5262; 5312; 5319; 5340; 5342; 5348; 5386; 5399; 5415; 5422; 5437; 5460; 5489; 5530; 5601; 5647; 5651; Butaritari Lagoon, Gilbert Islands; Fiji Islands; Niuafu Island.

As will be inferred from the foregoing list of stations, this is the

[4] Under the International Rules, despite Dr. Wilson's generous attitude toward Sars' work, all new species must be credited to Wilson and his name follows that of Sars in these particular instances.—W. L. S.

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most widely distributed species in the genus. It is especially abundant in surface tows and is included in all the plankton lists.

ACARTIA DISCAUDATA (Giesbrecht)

Dias discaudatus GIESBRECHT, Vierter Ber. Comm. Unters. deutsch. Meere, Jahrg. 7, p. 148, pl. 3, figs. 4, 22, 23; pl. 5, fig. 18; pl. 6, fig. 17; pl. 8, figs. 32, 33, pl. 9, fig. 30, 1883.

Stations 5175, 5176. Not included in any of the plankton lists and rarely reported by other observers.

ACARTIA HAMATA [Sars MS.] Wilson, new species

PLATE 2, FIGURES 1–5

Found in the Butaritari Lagoon on Makin, the northernmost of the Gilbert Islands and in surface tows 5 miles south of the Suva Lightship in the Fiji Islands.

Female.—Head separated from the first segment and constituting more than half of the metasome, widest across its posterior margin and a little narrowed anteriorly with a convex frontal margin. First segment a little wider than the head and three times as long as the second segment. Second, third, and the fused fourth and fifth segments narrowed a little, and increasing in length, the last with stout spines at its posterior corners and a pair of smaller dorsal spines in front of the posterior margin, each halfway between the corner and the midline. Genital segment barrel-shaped, longer than wide, with a pair of dorsolateral spines at its posterior corners. Abdomen 2-segmented, the anal segment a trifle the longer, the basal segment with a semicircular dorsal process projecting backward over the dorsal surface of the anal segment and reaching its center. Caudal rami about as wide as long, each with five setae, the second from the inside considerably longer than the others, which are approximately equal.

The first antennae reach the caudal rami and are slender, with the basal segments imperfectly separated, but displaying the most distinctive character of the species in the form of large spines. The basal segment has three spines, two on the anterior and one on the distal margin, the latter visible only in ventral view. The second segment has a single strongly hooked spine on the ventral margin turned inward toward the head. Some of these spines are visible from any point of view and thus furnish the most convenient means of identification. The second antennae, mouth parts, and first four pairs of legs are of the usual pattern in this genus. The fifth legs are peculiar in having the terminal spike longer than the seta, curved almost into a half circle and perfectly smooth. The seta is rather loosely plumed, especially toward the tip, which tapers to a fine point. Total length 1.32 mm. Greatest width 0.32 mm.

Type.—U. S. N. M. No. 70729, Fiji Islands, south of Suva Light.

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Remarks.—*A. hamata* differs from all the other species of the genus in the presence of the large spines on the basal segments of the antennae of the female. These stand out so prominently that they serve to identify the species at a glance.

ACARTIA LAXA Dana

PLATE 20, FIGURES 267–269

Acartia laxa DANA, Proc. Amer. Acad. Arts and Sci., vol. 2, p. 26, 1849; United States Exploring Expedition, 1838–1842 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1123, 1853; pl. 79, fig. 5 a–c, 1855.

Stations 5171; 5175; 5208; 5209; 5231. This was one of the new species described and figured by Dana in the Wilkes plankton from female specimens collected in the Sulu Archipelago in the Straits of Banca. Brady reported it in the *Challenger* plankton from the Philippine Islands and gave a description of the female with 11 figures. It does not appear in any of the other plankton lists, although T. Scott (1894, p. 65) found it to be of frequent occurrence in 38 tow nettings from the Gulf of Guinea. In spite of these descriptions and figures it has remained a questionable species with the male unknown. The *Albatross* material includes both sexes. My descriptions of them validate Dana's species.

Female.—Metasome elongate-elliptical, three and a half times as long as wide and narrowed a little anteriorly and posteriorly. Head fused with the first segment and obtusely rounded on the frontal margin; fourth and fifth segments fused and a little concave posteriorly, with stout spines at the corners which reach beyond the center of the genital segment. Urosome less than a third as long but more than a third as wide as the metasome, tapered regularly backwards, and 3-segmented. Genital segment somewhat trapezoidal in shape, being narrowed a little posteriorly, with straight sides. The two abdominal segments are the same width and length and combined are longer than the genital segment. The caudal rami are twice as long as wide, each armed with five plumose setae, which are so divergent that the flabellum or fan which they form is actually wider than long.

The first antennae are a little longer than the body and stand out on each side in the same straight line at right angles to the body axis. The endopod of the second antenna is about five times as long as the exopod, and the segmentation at the tip of the latter is invisible. The mandible has a large outer acuminate tooth separated from the others, and a row of seven smaller saw-teeth across the end, diminishing in size inwardly. The first four pairs of legs are similar to those in other species of the genus, the fifth pair being quite slender and 2-segmented. The second segment is more than twice as long as wide and is tipped

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with the usual stylet and plumose seta. The latter are of equal length, which is about two and a half times the length of the segment. The stylet is perfectly smooth and acuminate, and the seta is rather sparsely plumed. Total length 1.4 mm. Metasome 1.2 mm.

Male.—Metasome similar to that of female but only three times as long as wide and narrowed considerably more posteriorly than anteriorily. Head more or less completely separated from the first segment and comparatively short. Fourth and fifth segments completely fused and prolonged at the posterior corners into sharp spines, which reach the center of the genital segment and are slightly curved outward at their tips. Urosome about two-fifths as wide and one-third as long as the metasome if the caudal rami are included. Genital segment widened posteriorly, the lateral margins concave, the posterior corners each armed with two spines and a smaller one in front of them on the lateral margin. The two abdominal segments are the same size and rectangular in outline and together are longer than the genital segment. The basal segment is unarmed, but the anal segment has three minute setae on each side at the anterior corner. Caudal rami a little shorter than in the female, nearly as wide as long, each with five setae. Four of these setae are on the outer margin of the ramus and increase in length distally; the fifth one is terminal, and inside of it at the inner corner of the ramus is a minute spine. Here again the fan formed by the plumose setae is wider than long.

The first antennae just reach the anal segment and are quite slender, the right one slightly larger than the left. The second antennae, mouth parts, and first four pairs of legs are like those in the female. The fifth legs are shown on plate 20, figure 269. Each is uniramose and 4-segmented, the right one longer than the left. The plumose seta on the basal segment of each leg is long and stout, that on the right leg at the distal corner, on the left leg at the center of the outer margin. The second segment of the right leg has a scalloped inner margin, and the third segment has a large rectangular process at the inner distal corner. The fourth segment is curved backward around the end of this rectangular process. The last three segments of the left leg are about the same diameter and diminish in length distally.

Allotype male.—U.S.N.M. No. 73736, from station 5208.

Remarks.—The discovery of these males with their peculiar specific characters leaves no doubt as to the validity of Dana's species. Dana stated that the females of this species were bluish when alive. As the males do not differ from the females in the preserved material, they are probably like them when alive. The species does not seem to be widely distributed, but since over 100 specimens were obtained it may be fairly abundant in limited areas.

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ACARTIA LONGIREMIS (Lilljeborg)

Dias longiremis LILLJEBORG, De crustaceis ex ordinis tribus: Cladocera, Ostracoda et Copepoda, in Scania occurrentibus, p. 181, pl. 24, figs. 1–15, 1853.

Stations 15; 63; 75; 3782; 3799; 3829; 3834; 3867; 3878; 4010; 4190; 4700; 4756; 4926; 5234; 5246; 5320; 5340; 5399; 5415; 5530; 5601; H. 1888; Beaver Harbor, Vancouver Island, British Columbia; Kodiak, Alaska; Sabtán Island, Philippine Islands. Confined to two stations in the Monaco plankton, to very few stations in the *Carnegie* plankton, and absent from the other lists. The species is a true pelagic form, as stated by Sars (1903, p. 150), but it is not wholly confined to the open ocean. Several of the tows in which it was captured were vertical hauls from 500, 300, and 100 fathoms to the surface.

ACARTIA NEGLIGENS Dana

Acartia negligens DANA, Proc. Amer. Acad. Arts and Sci., vol. 2, p. 26, 1849; United States Exploring Expedition, 1838–42 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1121, 1853; pl. 79, fig. 3 a-c, 1855.

Stations 3; 9; 66; 70; 71; 76; 77; 3829; 3878; 3932; 4664; 5175; 5176; 5186; 5225; 5230; 5233; 5262; 5263; 5301; 5338; 5340; 5349; 5410; 5411; Fiji Islands. One of Dana's species originally obtained among the Kingsmill Islands just north of the Equator and afterward in the open ocean. It is found in all the plankton lists except the *Challenger*. The above record shows it to be fairly common among the Philippine Islands and off the coast of Japan. It is apparently most abundant at the surface. In the *Carnegie* plankton it is shown to descend to a depth of at least 100 meters; two of the *Albatross* catches were made in vertical hauls from as much as 100 and 300 fathoms to the surface.

ACARTIA TUMIDA Willey

PLATE 20, FIGURES 271–274

Acartia tumida WILLEY, Rep. Canadian Arctic Exped., 1913–18, vol. 7, Crustacea, pt. K: Marine Copepoda, p. 21K, figs. 25–27, 1920.

More than 100 specimens of this species, including both sexes, were taken by V. B. Scheffer, of the U. S. Biological Survey, June 10, 1937, in a surface tow at the anchorage off Attu Island, the westernmost of the Aleutian Islands. Originally established by Willey upon three females taken in a surface tow a little farther to the east, it has not been noted by any subsequent author. Since Willey's description and figures were very limited, a full description is here given, that of the male for the first time.

Female.—Metasome elongate-elliptical, three times as long as wide; head separated from the first segment and protruding over the base of the rostrum; fourth and fifth segments fused with rounded corners.

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Urosome half as wide and almost half as long as the metasome and made up of three segments. Genital segment as long as the two abdominal segments combined, its lateral margins convex. Basal abdominal segment twice as long as the anal segment, also with convex sides. Anal segment wider than long with straight sides, incised at the center of the posterior margin.

First antennae slender, just reaching the posterior end of the thorax and rather sparsely setose. Exopod of second antenna scarcely longer than the basal segment of the endopod. Mandible with one large acute outer tooth separated from the others and a row of smaller teeth across the end diminishing in size inwardly. First four pairs of legs biramose, exopods 3-segmented, endopods 2-segmented, much shorter than the exopods. Fifth legs uniramose, 3-segmented, basal segments totally fused across the midline. Middle segments subrectangular and slightly curved, with a large plumose seta at the outer distal corner. Third segments globular at the base and then narrowed into a long acuminate curved blade, which is perfectly smooth. Total length 2.25 mm. Metasome 1.66 mm. long, 0.65 mm. wide.

Male.—Metasome elongate-elliptical as in the female, not quite three times as long as wide, narrowed a little anteriorly but scarcely at all posteriorly. Head separated from the first segment and about as long as the thorax; fourth and fifth segments fused with rounded posterior corners. Urosome half as long but only a third as wide as the metasome and 4-segmented. Genital segment wider than the abdomen, with strongly convex lateral margins, making it a little wider than long. Basal abdominal segment flask-shaped, the enlarged distal end with convex sides; middle and anal segments with straight sides and as wide as the neck of the flask. Caudal rami one-half longer than wide and nearly as long as the anal segment.

First antennae reaching the middle of the genital segment and even more slender than in the female, neither one geniculate. Second antennae, mouth parts, and first four pairs of legs like those of the female. Fifth legs uniramose, 4-segmented, and relatively long and slender. Basal segment of the right leg bent at right angles, the second segment with a long seta on the posterior surface at about the center, the third segment with a large triangular process on the inner margin, the fourth segment curved into a half circle, with a small terminal seta and another near the center of the concave margin. The basal segment of the left leg is very short and has a short seta at the inner distal corner. The second and third segments each carry an outer seta, while the fourth segment is split and each portion is tipped with a large terminal seta. Total length 2.10 mm. Metasome 1.25 mm. long, 0.41 mm. wide.

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Allotype male.—U.S.N.M. No. 73739.

Remarks.—These *Albatross* specimens were all sizes from small ones whose dimensions were the same as those given by Willey up to the size here recorded. This suggests that Willey's specimens had not fully matured. The stocky urosome and the details of the fifth legs are distinguishing characters.

Genus ACROCALANUS Giesbrecht, 1888

ACROCALANUS GIBBER Giesbrecht

Acrocalanus gibber GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 4, sem. 2, p. 332, 1888; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 171, 175, pl. 6, fig. 32; pl. 10, fig. 37, 1892.

Stations 16; 65; 66; 71; 3789; 3799; 3829; 4009; 4037; 4644; 5175; 5185; 5186; 5190; 5208; 5223; 5226; 5228; 5232; 5233; 5240; 5262; 5263; 5301; 5320; 5340; 5382; 5386; 5387; 5399; 5412; 5413; 5424; 5434; 5437; 5651; Sabtán Island, Philippine Islands; Fiji Islands. Sewell (1929, p. 80) found this species to be one of the commonest among the *Investigator* collections in Indian waters. This *Albatross* record indicates that it is also widely distributed throughout the Philippines, although the number of specimens collected at each station seldom exceeded two or three. It was listed in the *Siboga* and *Carnegie* planktons.

ACROCALANUS GRACILIS Giesbrecht

Acrocalanus gracilis GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 4, sem. 2, p. 332, 1888; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 171, 175, pl. 6, fig. 27; pl. 10, fig. 35, 1892.

Stations 13; 16; 24; 30; 31; 41; 42; 45; 48; 52; 53; 65; 66; 67; 71; 73; 80; 3799; 3829; 3878; 3901; 3912; 3932; 3952; 3980; 4009; 4011; 4037; 4734; 4926; 4952; 5120; 5133; 5134; 5175; 5180; 5185; 5186; 5190; 5208; 5223; 5225; 5226; 5227; 5228; 5230; 5231; 5233; 5234; 5240; 5246; 5262; 5301; 5312; 5320; 5340; 5342; 5346; 5348; 5349; 5382; 5386; 5387; 5395; 5399; 5410; 5411; 5415; 5422; 5434; 5437; 5507; 5646; 5647; 5651; 5653; Fiji Islands; Sabtán Island, Philippine Islands; Charles Island, Galápagos. Well distributed in the *Siboga* plankton and abundant in the *Carnegie* plankton, the number of specimens at each station of the long list above nearly always reached two figures. In strong contrast with the preceding species, this one must be recorded as the most abundant species of the genus.

ACROCALANUS LONGICORNIS Giesbrecht

Acrocalanus longicornis GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 4, sem. 2, p. 332, 1888; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 171, 175, pl. 6, figs. 25, 33; pl. 10, figs. 34, 36, 39, 1892.

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Stations 3799; 3901; 4588; 5208; 5209; 5240; 5262; 5340; 5348; 5415; 5424; 5437; 5646; 5651; Sabtán Island, Philippine Islands. This species was well distributed in the *Siboga* (50 stations) and *Carnegie* (37 stations) planktons but did not appear in the others.

ACROCALANUS MONACHUS Giesbrecht

PLATE 2, FIGURE 6

Acrocalanus monachus GIESBRECHT, Atti. Accad. Lincei, Rome, ser. 4, vol. 4, sem. 2, p. 333, 1888; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 171, 175, pl. 6, figs. 26, 31; pl. 10, fig. 38, 1892.

Stations 16; 3683; 3765; 3829; 3901; 3912; 4722; 5155; 5223; 5226; 5246; 5262; 5320; 5386; 5399; 5437; 5488; Fiji Islands. Found at 4 stations in the *Siboga* plankton and 37 in the *Carnegie* plankton but not present in the others.

Genus AEGISTHUS Giesbrecht, 1891

AEGISTHUS MUCRONATUS Giesbrecht

Aegisthus mucronatus GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 7, sem. 1, p. 476, 1891; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 573, 577, pl. 46, figs. 46–49, 51; pl. 49, figs. 2, 3, 6, 10, 1892.

Stations 3; 3799; 4700; 4734; 5120; 5185; 5262; 5320. This species was taken in the *Siboga* plankton in 13 vertical hauls from 700 to 1,500 meters to the surface. Six of the *Albatross* hauls were vertical ones from 500, 350, 300, and 100 fathoms to the surface; two were surface tows. It appears otherwise only in the Monaco plankton list and must be regarded therefore as a poorly distributed species. M. W. Johnson (1937, p. 506) states, "On the west coast of America it is probable that there is a continuous deep-water distribution [of *mucronatus*] extending at least from southern California to the Straits of Juan de Fuca * * *." All the specimens of this species from stations 3799 and 5262 were males and were identified by Sars as *Aegisthus dubius*. *A. dubius* was originally established by Sars on males in the Monaco plankton. Farran (1926, p. 301) in his discussion of the *Research* plankton suggested that these were the males of the species *mucronatus*. More recently M. W. Johnson (1937, p. 505) has positively identified copepodid and adult *dubius* males as belonging to the species *mucronatus*. These *Albatross* specimens therefore must be regarded as *A. mucronatus*.

AEGISTHUS SPINULOSUS Farran

Aegisthus spinulosus FARRAN, Ann. Rep. Fisheries, Ireland, 1902–03, pt. 2, app. 2, p. 46, pl. 12, figs. 8–14; pl. 13, figs. 1–4, 1905.

Stations 5120; 5185; 5226; 5227; 5262; 5437. Originally established by Farran upon a single female specimen and does not appear

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in any of the plankton records. A single female was also taken at each of these *Albatross* stations, and therefore it must be a rare species.

Genus AETIDEUS Brady, 1883

AETIDEUS ARMATUS (Boeck)

Pseudocalanus armatus Boeck, Forh. Vid. Selsk., Christiania, vol. 14, p. 38, 1872.

Stations 63; 65; 67; 71; 4574; 4615; 4652; 4665; 4673; 4700; 4705; 4717; 4758; 5185; 5226; 5227; 5233; 5437; Fiji Islands. This species is found sparingly in all the plankton lists. Only a few specimens were taken at any of these *Albatross* stations except 4758 off the Alaskan coast, where 150 were obtained.

Genus AMALLOPHORA T. Scott, 1894

AMALLOPHORA TYPICA T. Scott

Plate 20, Figure 275

Amallophora typica T. Scott, Trans. Linn. Soc. London, ser. 2, Zool., vol. 6, pt. 1, p. 54, pl. 3, figs. 39–46, pl. 4, figs. 1–4, 1894.

Stations 2; 4673; 4700; 4707; 5185. This species was established by T. Scott in 1894 upon a single male specimen captured in the Gulf of Guinea. A single female was reported in the Monaco plankton, a single male in the *Siboga* plankton, two females in the *Carnegie* plankton, and neither sex in the other lists. Hence the 25 specimens, including both sexes, identified by Sars from the first four of these *Albatross* stations are many times the largest collection thus far obtained. The fifth legs of the female are shown on plate 20, figure 275, and can be identified by their obliquely truncated tips with a spine at either corner, the inner one much longer than the outer. In the male the fifth legs are uniramose, the left foot four times as long as the right.

Genus AMALLOTHRIX Sars, 1925

AMALLOTHRIX ARCUATA (Sars)

Plate 2, Figures 7, 8

Scolecithricella arcuata Sars, Bull. Inst. Océanogr. Monaco. No. 377, p. 10, 1920.
Amallothrix arcuata Sars, Rés. camp. sci. Albert de Monaco, No. 69, p. 185, pl. 51, figs. 14–21, 1925.

Stations 4665; 4667; 4679; 4716. Originally named and briefly described by Sars as a new species of *Scolecithricella* in 1920 and afterward transferred to his genus *Amallothrix* in the Monaco plankton, with complete description and figures. It occurred also in the *Car-*

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negie plankton, and was recorded by Sewell (1929, p. 217) from the Indian Ocean. Two of Sars' figures of specimens in the *Albatross* plankton are here reproduced and leave no doubt of the identity of the species.

AMALLOTHRIX CURTICAUDA (A. Scott)

Scolecithricella curticauda A. Scott, Copepoda of the *Siboga* Expedition, monogr. 29a, pt. 1, p. 94, pl. 30, figs. 1–9, 1909.

Stations 4679; 4687. Established by Scott upon two females in the *Siboga* plankton as a new species of *Scolecithricella* and afterward transferred to Sars' new genus *Amallothrix* in the Monaco report. Sars identified the species from these two *Albatross* stations.

AMALLOTHRIX EMARGINATA (Farran)

Plate 20, Figure 276

Scolecithrix emarginata Farran, Ann. Rep. Fisheries, Ireland, 1902–03, pt. 2, app. 2, p. 36, pl. 7, figs. 6–17, 1905.

Stations 71; 73; 75; 5120; 5287. Established by Farran as a new species of *Scolecithrix* in 1905 upon specimens from west of Ireland. Made a synonym of *Scolecithricella obtusifrons* by A. Scott in the *Siboga* plankton, but reestablished by Sars in the Monaco plankton and transferred to *Amallothrix*. The figure here given of the fifth legs corresponds with that published by Sars except that the distal joints are here distinctly separated, while the separation was only suggested by Sars. The species manifestly belongs in the present genus and constitutes a separate and perfectly valid species.

AMALLOTHRIX FALCIFER (Farran)

Plate 20, Figure 277

Scolecithrix falcifer Farran, Journ. Linn. Soc. London, Zool., vol. 36, No. 243, p. 262, pl. 8, figs. 9–14, 1926.

Stations 5263; 5437. Established by Farran as a new species of *Scolecithrix* upon a single female taken in a vertical haul from a depth of 100 fathoms in the Bay of Biscay. Rose (1933, p. 155) transferred the species to the present genus, but Farran's female still continued to be the only specimen known. These two *Albatross* stations yielded four more female specimens and constitute the first record from the Pacific. The small spine or tooth on the outer margin of the fifth leg, shown in plate 20, figure 277, and the rows of slender spinules on the first four pairs of legs are the distinguishing characters of the species.

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AMALLOTHRIX GRACILIS (Sars)

Scolecithricella gracilis Sars, Bull. Mus. Océanogr. Monaco, No. 26, p. 21, 1905a.
Amallothrix gracilis Sars, Rés. camp. sci. Albert de Monaco, No. 69, p. 176, pl. 49, figs. 9–21, 1925.

Stations 4665; 4707; 4717; 4719; 4721; 4722; 5233. Established by Sars as a new species of *Scolecithricella* in his preliminary report on the Monaco plankton, it was transferred in the final Monaco list to the present genus, which was new, and became the type species. It was briefly described and figured in the *Siboga* plankton but did not appear in the other lists.

AMALLOTHRIX INVENUSTA Wilson, new species

Plate 3, Figures 9–17

Station 4679. Fifteen females were taken at this station off Callao, Peru, and were identified by Sars as a new species, for which, however, he suggested no name. His drawings, here reproduced, well illustrate the species.

Female.—Metasome elliptical, considerably narrowed anteriorly and posteriorly and widest across the posterior margin of the cephalothorax. Head fused with the first segment, the two more than half the entire length; second and third segments about equal in length, fused fourth and fifth segments longer, with a reentrant posterior margin. Urosome short, less than a fourth as long as the metasome and about the same width throughout. Genital segment longer than wide and only slightly protruding ventrally, with nearly straight sides. Abdomen as long as the genital segment, 3-segmented, the segments about equal in length. Caudal rami as wide as long and somewhat divergent.

First antennae reaching the caudal rami; exopod of second antenna longer than the endopod, the setae of both rami very long and densely plumose. The five basal lobes of the second maxilla are very unequal in size, the three terminal sensory filaments are elongate and equal in length, while the five filaments bearing terminal buttons are much shorter and quite unequal. Neither of the two basal segments of the maxillipeds has processes; both have setae only. The second and third legs are armed with spines on the ventral surfaces of the endopods as shown on plate 3, figures 16, 17. The fifth legs have the second segment projecting at the inner distal corner, while the terminal segment is broadly rounded at its tip and armed there with two minute spines. The large setose spine on the inner margin is as long as the segment itself and is attached behind the center of the margin. Total length 3.38 mm. Metasome 2.81 mm. long and 1.25 mm. wide.

Type.—U.S.N.M. No. 70756.

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Remarks.—This new species was found at one station only and must therefore be limited in its distribution, but the number of specimens obtained indicates that it can breed fairly well in favorable localities.

AMALLOTHRIX LOBATA (Sars)

PLATE 20, FIGURE 278

Scolecithricella lobata SARS, Bull. Inst. Océanogr. Monaco, No. 377, p. 9, 1920.
Amallothrix lobata SARS, Rés. camp. sci. Albert de Monaco, No. 69, p. 184, pl. 51, figs. 8–13, 1925.

Station 5120. First placed by Sars in the genus *Scolecithricella* but later transferred to the genus *Amallothrix* when fully described and figured in the final Monaco report. It has not appeared in any other plankton list, and, inasmuch as all the Monaco specimens came from the temperate Atlantic, these *Albatross* specimens furnish the first Pacific record. From the scarcity of specimens it is evidently a rare species, though it is found in both oceans.

AMALLOTHRIX OBTUSIFRONS (Sars)

PLATE 4, FIGURES 21, 22

Amallophora obtusifrons SARS, Bull. Mus. Océanogr. Monaco, No. 26, p. 22, 1905a.
Amallothrix obtusifrons SARS, Rés. camp. sci. Albert de Monaco, No. 69, p. 179, pl. 50, figs. 1–16, 1925.

Stations 4664; 4665; 4668; 4679; 4707; 4715; 4717; 4719; 4721; 4722; 4727; 4730; 5233. This species was first placed in the genus *Amallophora* but was transferred to *Amallothrix* in the final Monaco report. The fifth leg of a female is shown on plate 4, figure 22, the distinguishing characters being the narrowing of the end segment at its tip, the curved terminal spine, and the minute spine on the outer margin opposite the large inner spine. As indicated by the list of stations above, this species is fairly well distributed. It appears in the *Carnegie* as well as the Monaco planktons.

AMALLOTHRIX PROPINQUA (Sars)

PLATE 20, FIGURE 279

Scolecithricella propinqua SARS, Bull. Inst. Océanogr. Monaco, No. 377, p. 9, 1920.
Amallothrix propinqua SARS, Rés. camp. sci. Albert de Monaco, No. 69, p. 178, pl. 49, figs. 22–27, 1925.

Stations 5185; 5223; 5231; 5233. Placed by Sars at first in the genus *Scolecithricella* and later transferred in the final Monaco record to the present genus. The species was founded upon a single female taken in a 4,800-meter haul off Lisbon, and no other specimen has

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since been found in the Atlantic. A few females were present in the tows at these Philippine stations and, with those found in the *Carnegie* plankton, constitute the records from the Pacific.

Genus AMENOPHIA Boeck, 1865

AMENOPHIA PELTATA Boeck

Amenophia peltata Boeck, Forh. Vid. Selsk. Christiania, for 1864, p. 269, 1865.

Station [5155]; Sabtán Island, Philippine Islands. One female of this harpacticoid copepod was taken in the tow at the anchorage at Sabtán Island [and two other females at 8 fathoms at station 5155 in the Sulu Archipelago]. According to Sars, it is not a strictly littoral species but is found also at moderate depths away from the shore and is thus liable to appear occasionally in the tow.

Genus ANOMALOCERA Templeton, 1837

ANOMALOCERA ORNATA Sutcliffe

Plate 21, Figures 285–295

Station 2396. A dozen specimens of this species of *Anomalocera* were found in the plankton of this *Albatross* station in the Gulf of Mexico.

Female.—Metasome elliptical, a little more than twice as long as wide and narrowed but little at each end. Head separated from the first segment, with a triangular front, a rounded knob over the base of the rostrum and a well-defined hook on each lateral margin. The fifth segment is also separated from the fourth with a large triangular spine at each posterior corner, the left one a trifle longer than the right. The urosome is not quite one-third as long as the metasome exclusive of the caudal rami and is decidedly asymmetrical, with four segments. The genital segment is as wide as long, with a broad lamina extending diagonally backward from the anterior portion of the left side ending in four stout spines, and a long curved spine near the posterior corner of the right side extending back nearly to the second abdominal segment. The abdomen is 3-segmented, the basal segment as long as the other two combined, the second segment very short, and the anal segment widened distally and incised on the posterior margin. The caudal rami are as long as the anal segment, the left one a little the larger, and each with five setae, three of which are on the outer margin.

The rostrum is split nearly to its base with slender filaments strongly curved backward. The first antennae are filiform and reach only to the third thoracic segment, with short and scattered setae. The exopod of the second antenna is only a fourth as wide and less than a

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half as long as the endopod, which is stout and 3-segmented. The first and second maxillae have a general form similar to those of *patersonii*, but differ in the details of structure. In the first legs the endopod does not reach the distal end of the second exopod segment, and in the three following pairs of legs the spines on the outer margins of the exopods are stout, with small accessory spines on the inside at the base. In the fifth legs the endopods are a little more than a fourth as long as the exopods and are 1-segmented, with the terminal half divided into two unequal rami. The exopods are 2-segmented, the basal four and a half times as long as the terminal segment, the inner distal corner of each segment prolonged into a long slender spine. Total length 4.25 to 4.75 mm. Metasome 3 mm. long, 1.35 mm. wide.

Male.—Metasome similar to that of the female except for the spines at the posterior corners. The spine on the left is short and curved, the one on the right is long and rodlike, curving around the process on the genital segment and almost reaching the second abdominal segment. The urosome, if the caudal rami are included, is half as long as the metasome and 5-segmented. The genital segment is wider than long, with a short triangular process on the left side and a much longer one on the right side. The four remaining segments are all the same width but vary in length, the second one the longest, the third one the shortest. The caudal rami are slender, enlarged distally, and as long as the last three abdominal segments combined.

The antennae are longer than in the female and reach the genital segment; the swollen portion of the right antenna is shown on plate 21, figure 289. The second antennae, mouth parts, and first four pairs of legs are like those of the female. The fifth legs are uniramose and 3-segmented, the right leg being similar to that of *patersonii* but the left leg having a very different end segment. Total length 3.95 to 4.25 mm.

Types.—[Shortly after this long-delayed paper had reached galley proof, I was informed by Paul L. Illg, associate curator of the National Museum's Division of Marine Invertebrates, that the *Anomalocera* that Dr. Wilson here described and named as new had been anticipated by William H. Sutcliffe, Jr., in the Journal of the Elisha Mitchell Scientific Society, vol. 65, No. 2, pp. 273–275, January 1950. We have therefore suppressed Dr. Wilson's previously given name. Sutcliffe's types, which were collected south-southwest of New River, N. C., in a surface tow, shallow water, 8 fathoms, are now on deposit in the National Museum, No. 89602, holotype female, and No. 89603, allotypic male. The specimens upon which the description by Wilson given above was based are from *Albatross* station 2396, surface, latitude 28°34′ N., longitude 86°48′ W., Gulf of Mexico, and carry U.S.N.M. No. 74111.—W.L.S.]

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Remarks.—This species is considerably larger than *patersonii* and lacks wholly the distinctive coloration of the latter. In both sexes the genital segment has a process on each side, the left one in the female looking like a hand with four spiny fingers, whence the specific name. In the female also the urosome is 4-segmented and quite asymmetrical, and in the male there is a row of knobs on the dorsal midline, one at the posterior margin of each segment, and a large ventral eye at the base of the rostrum.

ANOMALOCERA PATERSONII Templeton

Anomalocera patersonii TEMPLETON, Trans. Ent. Soc. London, vol. 2, p. 35, pl. 5, 1837.

Station 5234. This species appears in the Monaco, *Siboga*, and *Carnegie* planktons. It is a widely distributed species and is often abundant in a favorable locality.

Genus ARIETELLUS Giesbrecht, 1892

ARIETELLUS ACULEATUS (T. Scott)

PLATE 20, FIGURE 280

Rhincalanus aculeatus T. SCOTT, Trans. Linn. Soc. London, ser. 2, Zool., vol. 6, pt. 1, p. 31, pl. 2, figs. 11–24, 1894.

Stations 5185; 5231. Founded upon a single immature male from the Gulf of Guinea and placed in the genus *Rhincalanus* by T. Scott and afterward made a synonym of *Arietellus setosus* by Giesbrecht (1898, p. 124). The *Siboga* plankton yielded a single mature female, which A. Scott rightly judged to be specifically distinct from *setosus*. Upon this female and the immature male A. Scott reestablished his father's species. Farran afterward found a mature male in a surface haul from off New Zealand, which assured the validity of the species. A single male was found at each of the above *Albatross* stations. That they were both in the same immature stage as the original one from the Gulf of Guinea is seen in the fact that their fifth legs (fig. 280) are an exact replica of Scott's original figure.

ARIETELLUS ARMATUS Wolfenden

PLATE 4, FIGURES 23–26

Arietellus armatus WOLFENDEN, Deutsche Südpolar-Exped., 1901–1903, vol. 12, Zool., vol. 4, fasc. 4, p. 330, fig. 67, pl. 36, fig. 4, 1911.

Stations 6; 7; 27; 3878; 4689; 4705; 4722; 4730; 4734; 5319; 5451. Eight specimens, including both sexes, obtained from the first two stations east of Trinidad and north of French Guiana, were identified by Sars as a new species. Single specimens were obtained from the other stations. Wolfenden, in his report on the German South Polar

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Expedition, described a new species of *Arietellus* under the above name, but his description and his two figures are very incomplete and really include only a single specific character, the long frontal spine. This, however, is enough to identify the species with the *Albatross* specimens, and the name given by Wolfenden must be retained. But there are many other distinctive characters shown by the various appendages, especially the fifth legs, which warrant a more complete description of both sexes.

Female.—Body rather stout, head partially separated from the first segment by a dorsal groove; forehead produced into an elongated conical spine one-fourth as long as the head and pointed straight forward. Thorax widest at the junction of the head and the first segment, second and third segments narrowed but little, fourth and fifth segments fused and produced at the posterior corners into broad acutely pointed spines, which extend backward to the second abdominal segment and curve upward at their tips. Urosome a fourth as long and a fourth as wide as the metasome, with the frontal spine and the caudal rami both included in the length. The fifth thoracic segment is visible in dorsal view in the posterior sinus of the metasome and gives the urosome an appearance of being 5-segmented. Genital segment wider than long and not protruding ventrally, with nearly straight sides. Abdomen 3-segmented, each segment wider than long, the anal segment incised posteriorly. Caudal rami at the corners of the anal segment and divergent, each a little longer than wide and with five stout setae. The three middle setae are much longer than the other two but are only normally plumose; the outer seta is at the middle of the outer margin.

The first antennae are slender and reach just beyond the tips of the spines at the posterior corners of the metasome. The endopod of the second antenna is a little longer than the exopod; the mandible palp is uniramose with the endopod entirely lacking. The first four pairs of legs are biramose, the rami 3-segmented; the fifth pair (pl. 3, fig. 25) are uniramose and 3-segmented. Their basal segments are fused across the midline; the two plumose setae on the inner corners of the second segments and the appendicular filiform seta on the right leg are exceptionally long. The third segments are nearly as long as the other two combined, slightly swollen at the base and tapered into long acuminate points. Total length 5.20 mm.

Male.—Body similar to that of the female but smaller, the anterior spine fully as large as in the other sex but the spines on the posterior corners of the metasome considerably smaller. The urosome is 5-segmented and the caudal rami and their armature of setae are proportionally larger and more densely plumose. The first antennae

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reach the tips of the caudal rami and the left antenna is geniculate, the terminal portion 3-segmented. The second antennae, mouth parts, and first four pairs of legs are like those of the female. The fifth legs are asymmetrical, the right one longer and stouter than the left (pl. 4, fig. 26), with two curves giving it an S shape. The first two segments of the exopod have spines at their outer distal corners, long, slender, and acuminate. The second segment also has a short and stout spine on the surface at the distal end just inside the inner margin. The terminal segment is nearly three times as long as wide, bluntly rounded at its tip and without any spines or setae. The right endopod is apparently 2-segmented and attached to the inner margin of the basipod near the distal end. The first two segments of the left leg also carry spines at the outer distal corner, stouter than those on the right leg and slightly curved, and in addition the second segment has a sinuous distal margin. The terminal segment is armed with three fingerlike processes, one on the outer margin near the base and two unequal in size at the tip. The left endopod is 1-segmented, and its enlarged tip is bilobed; like the right endopod, it is attached not to the end of the basipod but on the inner margin. Total length 4.21 mm.

Neotypes.—U.S.N.M. No. 70735; station 7, latitude 8°04′ N., longitude 52°47′ W., North Atlantic.

Remarks.—The long frontal spine enables this species to be recognized at sight, and if desired the identity may be strengthened by the broad spines at the posterior corners of the metasome and the details of the fifth legs.

ARIETELLUS GIESBRECHTI Sars

PLATE 10, FIGURE 107

Arietellus giesbrechti Sars, Bull. Mus. Océanogr. Monaco, No. 40, p. 21, 1905b.

Stations 16; 4605; 4705; 5457. Established by Sars upon specimens obtained in the temperate Atlantic and fully described and figured in the Monaco plankton, this species does not appear in any of the other lists. This is the first record since the original discovery and the first from the Pacific Ocean.

ARIETELLUS PAVONINUS Sars

Arietellus pavoninus Sars, Bull. Mus. Océanogr. Monaco, No. 40, p. 22, 1905b; Rés. camp. sci. Albert de Monaco, No. 69, p. 333, pl. 120, figs. 1–8, 1925.

Station 4722. Established by Sars upon specimens obtained near the Azores, reported by Farran from west of Ireland, and identified by Sars in this *Albatross* plankton from southwest of the Galápagos

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Islands. Since it has never been recorded elsewhere, this is the first Pacific record, as in the case of the preceding species.

ARIETELLUS PLUMIFER Sars

PLATE 20, FIGURE 281

Arietellus plumifer SARS, Bull. Mus. Océanogr. Monaco, No. 40, p. 21, 1905b; Rés. camp. sci. Albert de Monaco, No. 69, p. 332, pl. 119, figs. 7–11, 1925.

Stations 4673; 4700; 4705; 4707; 4717; 4719; 4722; 4730; 4742; 4743; 5120; 5185. Established by Sars upon specimens of both sexes found in the northern Atlantic and does not appear except in the Monaco plankton. The list of stations shows that the species is fairly abundant in the Pacific. One of the males from station 5120 is worthy of notice because of variations in the details of the fifth legs as shown on plate 19, figure 281. There is sufficiently close correspondence to Sars' figure (pl. 119, fig. 10) of the fifth legs to show that the two are really the same species. But there are interesting differences in the details of the endopods, the second segment of the right exopod, and the terminal segment of the left exopod.

ARIETELLUS SETOSUS Giesbrecht

PLATE 20, FIGURES 283, 284

Arietellus setosus GIESBRECHT, Fauna und Flora des Golfes von Neapel, monogr. 19, p. 415, pl. 29, figs. 1, 3–7, 9–13, 21; pl. 39, figs. 34–36, 1892.

Stations 4638; 4721; 4730; 4734; 4740; 5451. This species has been reported in the *Siboga*, Monaco, and *Carnegie* plankton lists and is well distributed in every ocean. It may be recognized by the length of the caudal setae, which often equals that of the entire body. These setae are also often tufted and densely plumose; in fact, the plumes are so dense that they sometimes become badly matted in the preservative. The forehead is pointed and terminates in a short blunt spine. The first antennae do not quite reach the tips of the spines at the posterior corners of the metasome.

ARIETELLUS SIMPLEX Sars

PLATE 21, FIGURE 300; PLATE 22, FIGURES 301, 302

Arietellus simplex SARS, Bull. Mus. Océanogr. Monaco, No. 40, p. 22, 1905b; Rés. camp. sci. Albert de Monaco, No. 69, p. 334, pl. 120, figs. 7–12, 1925.

Stations 3; 4655; 4673; 4679; 4700; 4707; 4711; 4715; 4717; 4719; 4740; 4758; 4766; 5120; 5185; 5287. This is the largest species of the genus and was found at 1 *Siboga* and 14 Monaco stations. All the Monaco specimens were found in the Atlantic, while the single male of the *Siboga* plankton was taken in the Pacific. With the exception

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of those taken at station 3, all the *Albatross* specimens were found in the Pacific, chiefly south of the Equator. As would naturally be expected, these Pacific specimens show regional differences, which, however, are more than offset by the numerous points of correspondence, leaving no doubt as to their identity. The fifth legs of the males are exact replicas of the figure given by Sars in his Monaco report, but those of the female are proportionally elongated. One of the females at station 5120 showed the malformation appearing on plate 22, figure 302, the right leg lacking the two plumose setae at the inner distal corner of the proximal segment. The segment itself is also rounded off and narrowed enough to show that it never possessed those setae, although it does present an exceptionally long appendicular seta.

ARIETELLUS TRIPARTITUS, new species

PLATE 4, FIGURES 27–29

Stations 4740; 5301. Four females were found at the first of these stations between the Galápagos and Paumotu Islands; a single female was found at the second station, in the China Sea.

Female.—Metasome about two and a half times as long as wide and narrowed anteriorly and posteriorly, with smoothly rounded posterior corners. The head is fused with the first segment and the combined cephalothorax makes up about two-thirds of the metasome. A short crest projects from the center of the forehead which shows up better in a lateral view (pl. 4, fig. 28), where it is seen to be curved downward a little. The second segment is longer than either the third or the fused fourth and fifth segments, which are about equal in length. The posterior corners are broadly rounded and without spines, although they project backward nearly to the posterior margin of the genital segment. The urosome is 4-segmented and widened posteriorly, the anal segment longer than the other two abdominal segments combined and also wider. The caudal rami are as long as the anal segment, twice as long as wide and divergent. All the caudal setae were so mutilated that no idea of their length or of the density of the plumes upon them could be obtained.

First antennae just reaching the posterior margin of the third thoracic segment; endopod of second antenna more than half as long again as the exopod. Maxilliped slender, the basal segment not enlarged, and armed with setae only; first four pairs of legs like those in other species of the same genus. The fifth legs, however, are peculiar in that the second segment carries three stout plumose setae instead of two at its inner distal corner. The corner is broadly rounded, projecting more than in other species; the three setae are

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all the same size and length, one terminal and one on either side. The appendicular seta on the right leg is about twice as long as the one on the left leg and both are plumose. The end segment is a plump cone tipped with a curved spine, and the joint between the two segments is considerably wrinkled. Total length 4 mm. Male unknown.

Type.—U.S.N.M. No. 70761; station 4740, latitude 9°02'S., longitude 123°20'W., off Paumotu Islands.

Remarks.—The hooked lamina projecting from the forehead, the broadly rounded posterior corners of the metasome, and the three plumose setae on the second segments of the fifth legs are the distinguishing characters of this new species. No other species in the genus exhibits any one of these characters and hence the validity of the species is trebly assured.

Genus AUGAPTILUS Giesbrecht, 1889

AUGAPTILUS ANCEPS Farran

Augaptilus anceps Farran, Fisheries Ireland, Sci. Invest. for 1906, pt. 2, p. 79, pl. 8, figs. 15–19, 1908.

Stations 4685; 4719; 4721; 5120. Established by Farran upon two or three female specimens from west of Ireland and afterward fully described and figured by Sars in his Monaco report. The specimens from the first three *Albatross* stations were identified by Sars. They constitute the first record from the Pacific.

AUGAPTILUS GLACIALIS Sars

Augaptilus glacialis Sars, Norwegian North Polar Exped., vol. 5, Crustacea, p. 88, pls. 26, 27, 1900.

Station H. 2727. Originally described by Sars in his account of the copepods of the Norwegian North Polar Expedition and afterward included in the Monaco plankton, but not found in the other lists. Previously reported from the North Atlantic and Arctic Oceans. The above *Albatross* station is the first record from the Pacific Ocean. In the collections of the National Museum there are also seven females taken by C. S. McClain, of the U. S. S. *Alert* in Baffin Bay, lat. 73°17' N., long. 58°40' W., June 24, 1884. [The material from station H. 2727 was not found among the material returned to the Museum by Dr. Wilson.—W. L. S.]

AUGAPTILUS LONGICAUDATUS (Claus)

Hemicalanus longicaudatus Claus, Die freilebenden Copepoden, p. 179, pl. 29, fig. 3, 1863.

Stations 7; 2219; 4638; 4669; 4671; 4687; 4695; 4700; 4703; 4705; 4707; 4715; 4716; 4721; 4722; 4730; 5246. Many specimens were ob-

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tained from these 15 *Albatross* stations. Though quite abundant at 30 stations in the Monaco plankton, only six specimens were found in the *Siboga* plankton and three in the *Carnegie* plankton. These differences suggest that it may be seasonal in its distribution.

AUGAPTILUS MEGALURUS Giesbrecht

Augaptilus megalurus GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 5, sem. 1, p. 814, 1889; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 400, 414, pl. 27, fig. 28; pl. 28, fig. 7; pl. 29, fig. 20; pl. 39, fig. 47, 1892.

Stations 4700; 4707; 5120; 5227. Found at 13 stations in the Monaco plankton but not present in the other lists.

Genus BATHYCALANUS Sars, 1905

BATHYCALANUS RICHARDI Sars

Bathycalanus richardi SARS, Bull. Mus. Océanogr. Monaco, No. 26, p. 8, 1905a; Rés. camp. sci. Albert de Monaco, No. 69, p. 16, pl. 4; pl. 5, figs. 1–6, 1925.

Stations 4707; 4765; 4810; 5120; H. 3789. Found at 13 stations in the Monaco plankton but not appearing in the other lists. This is one of the largest of the free-swimming copepods. It usually remains at considerable depths, thus entirely escaping surface tows, and can be captured only in a deep vertical haul.

Genus BATHYPONTIA Sars, 1905

BATHYPONTIA ELONGATA Sars

Bathypontia elongata SARS, Bull. Mus. Océanogr. Monaco, No. 40, p. 24, 1905b; Rés. camp. sci. Albert de Monaco, No. 69, p. 356, pl. 126, 1925.

Stations 4679; 4681; 4687; 4717; 4719; 4740. Established by Sars as the type species of a new genus in his preliminary report on the Monaco plankton. His specimens were found in the tow at 21 Atlantic stations but the species does not appear in any of the other plankton lists. The specimens which he identified from the 6 *Albatross* stations constitute the first record from the Pacific.

BATHYPONTIA MINOR Sars

PLATE 22, FIGURE 303

Bathypontia minor SARS, Bull. Inst. Océanogr. Monaco, No. 101, p. 27, 1907; Rés. camp. sci. Albert de Monaco, No. 69, p. 360, pl. 127, figs. 12–18, 1925.

Stations 5120; 5320. Established upon two female specimens taken singly at two North Atlantic stations in the Monaco plankton. In this *Albatross* plankton also only a single female was found at each of the above stations. The species does not appear in any of the other lists. These are the first specimens reported after the original discovery, and they constitute the first record from the Pacific. The

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fifth legs, shown on plate 22, figure 303, are almost exactly like those of *Paracalanus parvus*, but the female from which they were taken was fully three times as large as a *parvus* female.

Genus BRADYIDIUS Giesbrecht, 1897

Undinopsis "Sars in litt.," SCHNEIDER, Tromsö Mus. Aarsheft., vol. 7, p. 131, 1884 (*nomen nudum*).

Bradyidius GIESBRECHT, Zool. Anz., vol. 20, p. 253, 1897.

Bradyanus VANHÖFFEN, Zool. Anz., vol. 20, p. 322, 1897a.

Undinopsis SARS, Crustacea of Norway, vol. 4, p. 31, 1902; and other authors.

Bradyidius A. SCOTT, *Siboga*-Expedition, monogr. 29a, pt. 1, p. 39, 1909.

Undinopsis WILSON, U. S. Nat. Mus. Bull. 158, pp. 552, 554, 555, 1932: Carnegie Inst. Washington Publ. 536, p. 210, 1942.

[As the correct name for this genus has long been in question and no satisfactory decision could be reached regarding it from the synonymies or arguments advanced by any of the authors concerned, original sources were directly consulted. To save others the time it has taken us, the results of this study are set forth below.

Undinopsis appears first to have been used by J. Sparre Schneider (1884, p. 131),[5] who credited the name to Sars "in litt." No matter which of the two was the author, the name is without standing, as neither the genus nor its unique species, *bradyi*, was diagnosed, nor was any particular type or previously published species cited at the time.

Bradyidius was proposed by Giesbrecht (1897, p. 253) for a species mistakenly identified by Brady (1878, p. 46) as the *Pseudocalanus* (now *Aetidius*) *armatus* of Boeck (1872, p. 38). Giesbrecht's (1897, p. 253) *Bradyidius* unquestionably takes precedence over *Bradyanus* Vanhöffen (1897a, p. 322). Vanhöffen based his claim to priority on the fact that his name had been published before Giesbrecht's in conjunction with the name of a new species, *Bradyanus armatus*, by Chun (1897, p. 28). Chun, however, merely listed identifications supplied him by Vanhöffen from the latter's then unpublished manuscript on the Fauna and Flora of Greenland (1897b, p. 292). Although this paper appeared in the same year, it was antedated by Giesbrecht's by some months. Precise dates cannot now be obtained, but it is to be noted that Giesbrecht's article appeared on page 253 of the Zoologischer Anzeiger with the printed annotation "eingeg. 9. Juli 1897," whereas Vanhöffen's article, which appeared on page 322 of the same

[5] In J. Sparre Schneider only the following is given regarding the genus (and species) in question: "74. *Undinopsis bradyi* G. O. Sars in litt./Af denne hidtil ubeskrevne art, der er en virkelig bund-/form, medbragtes endel ekspl r. fra samme lokalitet som fo- regaaende. Jeg har ogsaa fundet den ved Tromsø." (Of this hitherto undescribed species, which is a true bottom form, a number of specimens were obtained from the same locality as the foregoing [species, *Calanus finmarchicus*]. It has also been found near Tromso.—Translation by Dr. Adam G. Böving.)

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volume, is annotated "eingeg. 12. August 1897." In this article Vanhöffen admits that the larger account from which the name published by Chun was taken was still awaiting publication "in der nächstens erscheinenden 'Fauna und Flora von Grönland.'"

In 1902 Sars (p. 32) revealed that his earlier *nomen nudum*, *Undinopsis bradyi* (Sars, *in* Schneider, 1894, p. 131), was identical with *Bradyidius armatus*. (In this connection, see also T. Scott, 1900, p. 383.) Disregarding all that had gone before, Sars (1902, p. 33) sought to validate the generic name *Undinopsis* with no more argument than that it "ought to be preferred."

The *Albatross* secured some material of both of the species here discussed. No attempt is made to give all references in literature for either; only the more important synonymy is cited.—W. L. S.]

BRADYIDIUS ARMATUS Giesbrecht

Pseudocalanus armatus Brady, Monograph of British free and semiparasitic Copepoda, vol. 1, p. 46, 1878 (part; not *P. armatus* Boeck).

Undinopsis bradyi "Sars in litt.," Schneider, Tromso Mus. Aarsheft., vol. 7, p. 131, 1884 (*nomen nudum*).

Bradyidius armatus Giesbrecht, Zool. Anz., vol. 20, p. 253, 1897.—T. Scott, 17th Ann. Rept. Fish. Board, Scotland, pt. 3, No. 7, p. 248, 1899; 18th Ann. Rept., pt. 3, No. 11, p. 383, 1900.—van Breemen, Nordisches Plankton, Lief. 7, VIII, Copepoden, p. 31, fig. 31 a–c, 1908.—Pesta, *in* G. Grimpe u. E. Wagler, Die Tierwelt der Nord- und Ostsee, Lief. 8, pt. Xc$_1$, p. 33, 1927. (Van Breemen and Pesta credit the specific name to Brady instead of Giesbrecht, at the same time sustaining its precedence over *Undinopsis bradyi* Sars.)

[Stations 5185; 5190. Two females of this species, which was previously reported from the Atlantic and Pacific, usually from deep water, were taken in a vertical haul from 550 fathoms to the surface at the first of these two Philippine stations. Although identified also from the second station by Dr. Wilson, the specimens on which the record is based appear not to have been saved. This haul was also a vertical one from 250 fathoms.—W. L. S.]

BRADYIDIUS SIMILIS (Sars)

Plate 35, Figure 542

Bradyanus armatus Chun, Die Beziehungen zwischen dem arktischen und antarktischen Plankton, p. 28, 1897.—Vanhöffen, Zool. Anz., vol. 20, p. 322, 1897a; *in* Erich von Drygalski, Grönland-Expedition der Gesellschaft für Erdkunde zu Berlin, 1891–1893, vol. 2, pt. 1, p. 280, 1897b.

Undinopsis similis Sars, Crustacea of Norway, vol. 4, p. 34, pl. 21, 1902.

Undinopsis armatus Vanhöffen, Zool. Jahrb., Abt. Syst., vol. 25, p. 517, 1907.

Bradyidius similis van Breemen, Nordisches Plankton, Lief. 7, VIII. Copepoden, p. 32, fig. 32 a, b. 1908.

Stations 5030; 5227. Four females were identified from the first of these stations and a male and two females from the second. Hitherto

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the species has been confined to the Arctic Ocean and the North Sea, and this is the first record from the Pacific. The fifth legs of the male (fig. 542) show rudiments of endopods.

Genus CALANOIDES Brady, 1883

CALANOIDES BREVICORNIS (Lubbock)

Calanus brevicornis LUBBOCK, Trans. Ent. Soc. London, new ser., vol. 4, p. 17, pl. 3, 1856.

Stations 5129; 5246; 5320. About 75 specimens, nearly all fully grown females, were found in the plankton taken at station 5320 in the China Sea off Formosa. It was reported also in the *Siboga* and Monaco lists. The pointed forehead, with its rudiments of a median crest and its forward projection in lateral view, furnishes an easy identification for the species. It was also noted in these specimens that the anterior portion of the head in front of the mouth parts was of a different color from that of the body, sometimes whitish, sometimes reddish coppery, and was more or less transparent. The fifth legs of the male in this species are no longer than the fourth pair and thus relatively much shorter than in Brady's genotype, *C. patagoniensis* (Brady, 1883, p. 75).

Genus CALANOPIA Dana, 1853

CALANOPIA AMERICANA F. Dahl

Calanopia americana F. DAHL, Ber. Naturf. Ges. Freiburg, new ser., vol. 8, p. 21, pl. 1, figs. 23–26, 1894a.

Station 5186. Twelve specimens, mostly male, were found at this station off Panay Island, Philippine Islands. The species, which was founded by Dahl upon specimens of both sexes collected in the lower Amazon River, was reported by Scott in the *Siboga* plankton from off the Bermuda Islands, by Farran (1929, p. 274) from off Rio de Janeiro, and in the *Carnegie* plankton from the Caribbean region. Although Dahl's specimens were obtained a considerable distance from the ocean, the water from which they were taken showed a salinity of 11.8 percent. All the other specimens came from the open ocean, and hence this must be listed as an oceanic species capable of withstanding considerable reduction in salinity.

CALANOPIA AURIVILLII Cleve

Calanopia aurivillii CLEVE, Kongl. Svenska Vet.-Akad. Handl., vol. 35, No. 5, p. 37, pl. 2, figs. 17–23; pl. 3, figs. 1–10, 1901.

Stations 5175; 5176, 5185; 5233; 5234; 5262; 5308; 5340; 5415; 5530; 5601; Sabtán Island, Philippine Islands. This species appears in the *Siboga* plankton but in none of the other lists. Cleve's type speci-

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mens came from the Malay Archipelago, while these *Albatross* stations are all among the Philippine Islands.

CALANOPIA ELLIPTICA (Dana)

Pontella elliptica DANA, Proc. Amer. Acad. Arts and Sci., vol. 2, p. 27, 1849.
Calanopia elliptica DANA, United States Exploring Expedition, 1838–42 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1182, 1853; pl. 79, fig. 6 a, b, 1855.

Stations 2396; 4037; 5102; 5133; 5175; 5180; 5185; 5186; 5190; 5196; 5223; 5225; 5228; 5230–5232; 5246; 5262; 5263; 5319; 5320; 5338; 5340; 5348; 5422; 5434; 5553; Fiji Islands; Gilbert Islands. Present in all the plankton lists except the Monaco.

CALANOPIA MINOR A. Scott

PLATE 22, FIGURE 304

Calanopia minor A. SCOTT, Trans. Liverpool Biol. Soc., vol. 16, p. 406, pl. 1, figs. 1–5, 1902.

Stations 2396; 4009; 4037; 4952; 5102; 5133; 5134; 5175; 5180; 5185; 5186; 5196; 5223; 5225; 5226; 5228; 5230–5232; 5246; 5263; 5320; 5338; 5340; 5348; 5387; 5434; 5489; 5578; Charles Island, Galápagos; Iloilo Straits, Philippine Islands. This species has been reported from the Red Sea, the northern area of the Indian Ocean, and appears in the *Siboga* lists, where it frequently occurs with *C. elliptica.*

CALANOPIA SARSI, new species

PLATE 5, FIGURES 30–33

Forty specimens, including both sexes, were taken in the surface plankton off the Fiji Islands, south of the Suva Light. These were identified by Sars as a new species, and as he suggested no name they have been named for him.

Female.—Metasome elliptical, narrowed considerably anteriorly but only a little posteriorly. The forehead is bluntly pointed and the posterior corners of the fused fourth and fifth segments are produced into symmetrical acuminate spines, which are inclined a little outward. Urosome two-fifths as long as the metasome and 2-segmented, the genital segment the same length as the abdomen but twice as wide. Caudal rami shorter than the abdomen but three times as long as wide, each with five setae, all rather short.

First antennae slender and 19-segmented, reaching the center of the genital segment; the second antennae, mouth parts, and first four pairs of legs similar to those in other species of the genus. Fifth legs symmetrical, each 4-segmented, the two basal segments (basipod) considerably thickened, the two distal segments (exopod) narrower

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and about equal in length. The first of these exopod segments has a single acuminate spine at its distal end that is as long as the terminal segment. The latter is tipped with three acuminate spines, the inner one longer and slenderer than the others. Total length 1.90 to 2 mm. Metasome 1.50 mm. long, 0.50 mm. wide.

Male.—Metasome similar to that of the female, but the forehead is smoothly rounded and the spines at the posterior corners are asymmetrical, the right one wider and longer than the left and distinctly notched on its inner margin. Urosome two-fifths as long as metasome and 5-segmented, the anal segment very short and narrower than the others, which are all about the same width, one-fifth as wide as the metasome.

The first antennae reach the center of the third segment of the urosome; the right antenna is geniculate, the terminal portion made up of four segments of about equal length. The segment in front of the flexure is the same length as the terminal segments but considerably wider. The second antennae, mouth parts, and first four pairs of legs are like those of the female. Each fifth leg is 4-segmented as in the female; the second segment of the right leg is invaginated at its distal end where it articulates with the third segment. The latter is considerably swollen and carries on its outer margin the acuminate thumb of the chela. The curved terminal segment forms the dactylus and is somewhat flattened, with two setae on its inner surface and three at its tip. The third segment of the left leg has a stout spine at its outer distal corner and the end segment carries three terminal setae three times as long as the segment and an inner fourth one only half as long as the segment. Total length 1.82 mm.

Types.—U.S.N.M. No. 70742; off the Fiji Islands, south of the Suva Light.

Remarks.—The structure of the fifth legs in both sexes and the asymmetry of the spines at the posterior corners of the metasome in the male are the distinctive characters of this new species.

CALANOPIA THOMPSONI A. Scott

PLATE 20, FIGURE 282

Calanopia thompsoni A. SCOTT, Copepoda of the *Siboga* Expedition, monogr. 29a, pt. 1, p. 178, pl. 69, figs. 1–8, 1909.

Stations 5105; 5186; 5223; 5342. Originally established by Scott upon 160 specimens including both sexes from four *Siboga* stations in the tropical Pacific, but not found in any of the other lists. This is the largest species of the genus and is readily distinguished from any of the others by its size and by the lateral hooks on the sides of the head like those in the genus *Pontella*. The *Albatross* specimens

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were at first assigned to the genus *Pontella*, but the fifth legs shown in the accompanying figure prove that they really belong to this genus and species.

Genus CALANUS Leach, 1819

CALANUS CRISTATUS Krøyer

Calanus cristatus KRØYER, Voy. Comm. sci. Nord Scandinavie . . . la corvette *La Recherche*, Atlas, pl. 41, 1842–45; Naturh. Tidsskr., Kjøbenhavn, ser. 2, vol. 2, pp. 546, 553, 1848; p. 607, 1849.

Stations 31; 33; 35; 37; 38; 41–44; 46; 48–50; 51; 52; 57; 60; 2859; 2861; 3602; 4747; 4757–4760; 4763; 4765; 4766; 4781; 4785; 4793; 4805; 4806; 5030; H. 1689; H. 2700. These stations for the greater part are in Alaskan waters and in the Bering and Okhotsk seas; three stations lie off the west coast of the United States; only one or two specimens were obtained at each station except 4793, where 50 were captured. Until very recently, this species has been a puzzle to investigators, since no adults of either sex could be found. The present author has handled many hundreds of specimens, but they always proved to be females in the last copepodid stage. This was true of the *Carnegie* specimens and of this *Albatross* material. But in November 1937 a vertical haul in the deep waters of Sagami Bay in northern Japan was found to contain adults of both sexes, which have been described by Dr. Otohiko Tanaka (1938, p. 599), of the Mitsui Institute of Marine Biology, near Simoda, Izu. The fifth legs in both sexes have 3-segmented rami, and the right fifth leg in the male is modified as in other males of the genus. The frontal crest, so prominent in the immature female, is retained in the adult form but almost entirely disappears in the mature male. The species founded and maintained upon a late developmental stage for nearly a century now becomes fully established.

CALANUS FINMARCHICUS (Gunnerus)

Monoculus finmarchicus GUNNERUS, Skrifter Kjøbenhavnske Selskab., vol. 10, p. 175, figs. 20–23, 1765.

Stations 12; 13; 29; 33–35; 37; 38; 41; 42; 46; 48–50; 52; 57; 2770; 2859; 2861; 3602; 3696; 4655; 4673; 4753; 4756–4760; 4762; 4767; 4785; 4800; 4806; 5030; 5655; H. 1689; H. 2701; Amchitka Island; Behm Canal; Yes Bay, Alaska. This is the best known and most widely distributed copepod in northern latitudes and is found in all of the plankton lists except the *Siboga*. Because of its size and the enormous numbers it attains in favorable localities it becomes of great economic importance as a food supply for many fishes and even for some whales.

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CALANUS HELGOLANDICUS (Claus)

Cetochilus helgolandicus CLAUS, Die freilebenden Copepoden, p. 171, pl. 26, figs. 2–9, 1863.

Station 37; 57; 4574; 4652; 4655; 4657; 4673; 4759. This species appears in the *Carnegie* and Monaco planktons but not in the other lists. Sars, who identified these *Albatross* specimens, stated in the Monaco report (p. 6) that this is a more southern form than *finmarchicus* and that it is never found in the Arctic Ocean but is widely distributed in all other regions. It is worthy of note that four of the above stations are located off the west coast of Peru in the current that flows north from the Antarctic.

CALANUS HYPERBOREUS (Krøyer)

Calanus hyperboreus KRØYER, Kong. Danske Vidensk. Selsk., Nat. math. Afh., vol. 7, p. 310, pl. 4, fig. 23, 1838.

Stations 31; 33; 2195; 3602; 4747; 4793; 4805; 4806; H. 2700. This species also appears in the *Carnegie* and Monaco planktons but not in the others. It is a boreal species found in the Arctic and northern Atlantic and Pacific Oceans often in company with *finmarchicus*.

CALANUS TONSUS Brady

Calanus tonsus BRADY, Voyage of H. M. S. *Challenger*, Zool., vol. 8, pt. 23, Copepoda, p. 34, pl. 4, figs. 8, 9, 1883.

Stations 12; 80; 4758; 4766; 4793; 5030; 5246. Established by Brady upon specimens from the southern Pacific and Atlantic, it was recorded from one station in the *Carnegie* plankton but does not appear in the other lists.

Genus CALIGUS Müller, 1785

CALIGUS CORYPHAENAE Steenstrup and Lütken

Caligus coryphaenate STEENSTRUP and LÜTKEN, Dansk. Vid. Selsk. Skriv., vol. 5, p. 360, pl. 4, fig. 7, 1861.

Station 4679. A single male of the parasitic species was captured swimming in the surface plankton at the above station.

CALIGUS LATIFRONS Wilson

Caligus latifrons WILSON, Proc. U. S. Nat. Mus., vol. 28, pp. 587–589, pl. 12, figs. 140–149, 1905.

Stations 4952; 5223, 5460. Since only one female was taken at each of these stations and the male still remains unknown, this must be regarded as a rare species. Until taken by the *Albatross* this species, based upon a single female without data as to the host or locality, had not been reported since described by the present author. The

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original lack of data was no doubt due to the fact that the original specimen, like the *Albatross* specimens, was captured while swimming freely in the plankton.

CALIGUS RAPAX Milne Edwards

Caligus rapax MILNE EDWARDS, Hist. nat. Crust., vol. 3, p. 453, pl. 38, 1840.

Station 2396. At this station in the Gulf of Mexico a single male believed to be this species was taken in a surface tow. The species is parasitic upon a great variety of hosts without showing particular preference for any of them. Both sexes have been reported many times as captured while swimming freely among the pelagic forms.

CALIGUS THYMNI Dana

PLATE 22, FIGURE 317

Caligus thymni DANA, Proc. Amer. Acad. Arts and Sci., vol. 2, p. 56, 1849; United States Exploring Expedition, 1838–1842 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1353, 1853; pl. 94, fig. 3 a-c, 1855.

Caldera Bay anchorage, west coast of Mindanao, Philippine Islands. The tow at this anchorage was made by setting the net in the tide current at the gangway; many copepods were obtained. Among them was the male of a species described as new by Dana in the Wilkes plankton and named *Caligus thymni*. His figures included a ventral view of the male and a dorsal view of the genital segment, abdomen, and ovisacs of the female. The only full length dorsal view of either sex was one of the male published by T. Scott (1894, p. 129) which did not show the markings on the dorsal surface of the carapace. Accordingly, figure 317 is here included in order to call attention to certain important characters.

The carapace forms two-thirds of the entire length and is three-fourths as wide as long. On the dorsal surface the transverse groove is in front of the center, and the lateral grooves are pushed well over toward the sides, thereby making the area included by them exceptionally large. The genital segment is one-half wider than long, with convex lateral margins and two pairs of rudimentary legs on the posterior margin. The caudal rami are less than half as long as the anal segment and are wider than long, each with four setae. For ready reference this male has been given U.S.N.M. No. 74113.

Genus CALOCALANUS Giesbrecht, 1888

CALOCALANUS PAVO (Dana)

Calanus pavo DANA, Proc. Amer. Acad. Arts and Sci., vol. 2, p. 13, 1849; United States Exploring Expedition, 1838–1842 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1061, 1853; pl. 72, fig. 12 a, b, 1855.

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Stations 8; 9; 14; 54; 64–67; 71; 3782; 3789; 3799; 3829; 3878; 3901; 4009; 4644; 5175; 5196; 5301; 5399; 5651; Fiji Islands. Originally established by Dana in the genus *Calanus*, this species was present in the *Siboga* and the *Carnegie* planktons, where it was abundant.

CALOCALANUS STYLIREMIS Giesbrecht

Calocalanus styliremis GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 4, sem. 2, p. 333, 1888; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 176, 185, pl. 9, figs. 15, 18, 29; pl. 36, figs. 46–48, 1892.

Stations 46; 65; 4010; 5651; Fiji Islands; Hawaiian Islands. This species, well distributed in the *Carnegie* plankton, was found at a single station in the Monaco plankton, but did not appear in the other lists.

Genus CANDACIA Dana, 1846

CANDACIA AETHIOPICA (Dana)

Candace ethiopica DANA, Proc. Amer. Acad. Arts and Sci., vol. 2, p. 23, 1849; United States Exploring Expedition, 1838–1842 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1115, 1853; pl. 78, fig. 5 a–f, 1855.

Stations 6; 7; 26; 27; 30–32; 39; 41; 52–54; 57; 60; 63; 65; 3799; 3829; 3867; 3878; 3901; 3932; 3980; 4009–4011; 4037; 4190; 4611; 4684; 4688; 4692; 4705; 4724; 4725; 4730; 4731; 4738; 4952; 5102; 5105; 5120; 5133; 5185; 5223; 5224; 5308; 5340; 5382; 5387; 5553; 5578; 5646; Fiji Islands. Found in all the plankton lists except the *Challenger*. In the *Albatross* collections it is well distributed but nowhere abundant except at station 4688 off the west coast of Peru, where more than a hundred specimens were obtained in a surface tow. The characteristic dark color of the appendages remains even after long preservation.

CANDACIA ARMATA (Boeck)

Candace armata BOECK, Forh. Vid. Selsk., Christiania, vol. 14, p. 39, 1872.

Stations 2236; 3829; 4010; 4611; 4615; 4640; 4757; 4793; 5105; 5120; 5129; 5175; 5180; 5185; 5190; 5196; 5230; 5231; 5399; 5412. Found in all the planktons except that of the Wilkes Expedition and very widely distributed. In the *Albatross* tows it is chiefly confined to stations off the west coasts of Mexico and Central America.

CANDACIA BIPINNATA (Giesbrecht)

Candace bipinnata GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 5, sem. 1, p. 815, 1889; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 424, 439, pl. 22, fig. 20; pl. 39, figs. 27, 29, 1892.

Stations 3; 5; 7; 15; 24; 30; 41; 43; 49; 65; 76; 3799; 3800; 3901; 4010; 4011; 4615; 4700; 5129; 5133; 5155; 5180; 5185; 5224; 5225;

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5234; 5601. These were mostly surface tows; a few were vertical hauls from 550, 300, 100 fathoms or less to the surface. The species was present in the *Siboga*, Monaco, and *Carnegie* planktons in small numbers.

CANDACIA BISPINOSA (Claus)

Candace bispinosa CLAUS, Die freilebenden Copepoden, p. 191, pl. 27, figs. 9–10; pl. 28, fig. 5, 1863.

Stations 3; 5; 7; 15; 19; 24; 30; 41; 42; 49; 62; 63; 65; 76; 77; 3412; 3799; 3834; 3867; 3878; 3901; 4037; 4611; 4644; 4646; 4700; 4952; 5105; 5110; 5129; 5134; 5175; 5180; 5185; 5186; 5196; 5223; 5225; 5232; 5233; 5262; 5434; Nasugbu Bay, Luzón, Philippine Islands. Well distributed in the *Carnegie* plankton, but rare in the *Siboga* and Monaco planktons.

CANDACIA CURTA (Dana)

Candace curta DANA, Proc. Amer. Acad. Arts and Sci., vol. 2, p. 23, 1849; United States Exploring Expedition, 1838–1842 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1116, 1853; pl. 78, fig. 6 a–d, 1855.

Stations 39; 4540; 4635; 4671; 4673; 4691; 4699. This species was present at 6 Pacific stations in the *Carnegie* plankton, 24 Pacific stations in the *Siboga* plankton, and 3 Atlantic stations in the Monaco plankton.

CANDACIA ELONGATA (Boeck)

Candace elongata BOECK, Forh. Vid. Selsk., Christiania, vol. 14, p. 39, 1872.

Station 4716. Identified by Sars from this single station near the Galápagos Islands in the *Albatross* plankton and from eight Atlantic stations in the Monaco plankton, but not occurring in the other lists.

CANDACIA LONGIMANA (Claus)

Candace longimana CLAUS, Die freilebenden Copepoden, p. 190, pl. 27, fig. 17; pl. 28, fig. 4, 1863.

Stations 222; 3799; 3878; 4611; 4638; 4646; 4685; 4691; 4700; 4736; 4738; 5155; 5185; 5263; 5489. Identified by Sars from 7 of these 14 *Albatross* stations and from 35 stations in the Monaco plankton, but found at only 2 stations in the *Carnegie* and 2 in the *Siboga* plankton.

CANADACIA NORVEGICA (Boeck)

Candace norvegica BOECK, Forh. Vid. Selsk., Christiana, for 1864, p. 235, 1865.

Stations 31; 41; 3799; 3878; 3901; 4010; 4011; 4190; 4611; 4638; 4646; 4785; 4806; 5129; 5180; 5185; 5186; 5223; 5309; 5340; 5430. This species was obtained at 25 Atlantic and Pacific stations in the

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Carnegie plankton but was not present in any of the other lists. It has also been reported from the Pacific by Sewell (1932, p. 336).

CANDACIA PACHYDACTYLA (Dana)

Candace pachydactyla DANA, Proc. Amer. Acad. Arts and Sci., vol. 2, p. 23, 1849; United States Exploring Expedition, 1838–1842 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1113, 1853; pl. 78, figs. 2 a, b; 3 a, b; 4 a–c, 1855.

Stations 2195; 4598; 4640; 4655; 4664; 4671; 4679; 4707; 4721; 4730; 4743; 5105; 5190; Port Binanga, Luzón, Philippine Islands. Dana's original specimens came mostly from the southern Atlantic, with a few from the China Sea. He gave the color as "smoky with black bands about the cephalothorax; the extremities of the antennae and some of the natatory legs black." There are still traces of this coloration in the *Albatross* specimens after 30 years' preservation. The species is present in all the plankton lists, and abundant in the *Siboga* plankton, where it is recorded from 52 stations.

CANDACIA SIMPLEX (Giesbrecht)

Candace simplex GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 5, sem. 1, p. 815, 1889; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 424, 440, pl. 21, figs. 10, 21, 25, 30, 31; pl. 22, figs. 21, 29; pl. 39, figs. 3, 14, 1892.

Stations 2; 14; 15; 27; 30; 31; 39; 41; 42; 48; 49; 51; 52; 57; 59–61; 65; 66; 71; 173; 3765; 3799; 3800; 3834; 3839; 3878; 3927; 3929; 4009; 4010; 4037; 4190; 4605; 4607; 4611; 4635; 4644; 4659; 4667; 4679; 4691; 4699; 4700; 4705; 4721; 4722; 4730; 4743; 4751; 4753; 4926; 4952; 5102; 5120; 5129; 5134; 5175; 5180; 5185; 5186; 5190; 5196; 5223–5231; 5233; 5240; 5246; 5262; 5263; 5301; 5319; 5320; 5334; 5340; 5342; 5358; 5382; 5399; 5412; 5414; 5415; 5422; 5424; 5434; 5437; 5530; 5553; 5578; 5611; 5633; Marshall Islands; Sabtán Island, Philippine Islands; Fiji Islands.

The above list shows this to be the most widely distributed species in the genus; the same was true in the *Carnegie* plankton. It is also abundant in the *Siboga* and Monaco lists.

CANDACIA TENUIMANA (Giesbrecht)

Candace tenuimana GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 5, sem. 1, p. 814, 1889; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 424, 439, pl. 21, figs. 8, 28, 29; pl. 22, figs. 2, 30, 37, 1892.

Stations 4714; 4724. Two females were obtained at station 4714 near the Galápagos Islands in a surface tow. Sars identified them as belonging to this species and so recorded them, but somewhere during the journeying back and forth the specimens themselves have been

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lost. There is also a record of the species from station 4724, likewise in the Galápagos. This species was present in the *Carnegie* and *Siboga* plankton lists.

CANDACIA TURGIDA, new species

Plate 22, Figures 305–308

Stations 5102; 5319; 5422. Ten female specimens were obtained at station 5102 off southern Luzón, Philippine Islands. They cannot be referred to any of the described species and so are designated a new species. Other specimens were found in the China Sea near Formosa, station 5319, and between Panay and Guimaras, Philippine Islands, station 5422.

Female.—Metasome elliptical, two and a half times as long as wide, and narrowed at both ends. The anterior portion of the head with parallel sides is reduced to less than half the width of the thorax, and the forehead protrudes scarcely at all at the center. The first three segments of the thorax increase in length posteriorly and diminish in width. The fused fourth and fifth segments are the same length as the third, almost squarely truncated posteriorly, with short acute spines at the corners. Urosome one-third as long and one-fourth as wide as the metasome and 3-segmented. Genital segment a trifle longer than wide, with nearly parallel sides, the anterior end protruding ventrally. From the posterior margin of the protuberance a conical process extends downward and backward a little beyond the end of the segment. This process is considerably darker than the segment and is perfectly opaque. The basal abdominal segment is as long as the genital segment, while the anal segment is only half as long with its posterior corners obliquely truncated. The caudal rami are as long as the anal segment, slightly longer than wide and tapered distally.

The first antennae reach the caudal rami and are 24-segmented, the 6 basal segments considerably widened, the remaining 18 segments abruptly narrowed and subfilose. The basal portion and the transition into the terminal portion are shown enlarged in figure 307. The terminal portion is sometimes bent backward at its junction with the basal portion as shown in the figures, although there is no geniculate joint. In one specimen both antennae were bent in this way; in two others only one antenna was so bent, the other being straight. In the second antennae the basal segment of the endopod is considerably thickened and the short exopod is attached to its inner margin near the base. The first four pairs of legs are similar to those in other species of the genus, the exopods 3-segmented, the endopods 2-segmented. The fifth legs are uniramose and 3-segmented; the proximal

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segment has a rounded knob on the outer margin near the base, the second segment has a short seta near the outer margin. The third segment ends in a curved blunt finger process nearly half as long as the segment. There is a spine on the outer margin at the center of the segment and two more close to the tip outside the finger process. On the inner margin at the base of this process are two naked setae, the distal one longer than the process, the proximal one the same length as the latter. Total length 2.1 to 2.3 mm. Metasome 0.8 mm. wide.

Types.—U.S.N.M. No. 74112; station 5102, latitude 14°45′ N., longitude 120°12′30″ E.; off southern Luzón, Philippine Islands.

Remarks.—These fifth legs are almost an exact replica of those in *bispinosa;* the structure of the first antennae and the genital segment decisively prohibit inclusion in that species. In fact, there is nothing even remotely suggestive of the ventral process on the genital segment in any of the other species in the genus.

CANDACIA VARICANS (Giesbrecht)

Candace varicans GIESBRECHT, Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 424, 439, pl. 21, figs. 3, 4, 11, 24; pl. 22, figs. 10, 25; pl. 39, figs. 2, 23, 1892.

Stations 6; 54; 5180; 5223. Found at three stations in the *Carnegie* plankton and at two stations in the Monaco plankton but not in the other lists. This is one of the rarer species, and these *Albatross* specimens constitute the second record from the Pacific area, Sewell having reported it from the Indian Ocean (1932, p. 338).

Genus CANTHOCALANUS A. Scott, 1909

CANTHOCALANUS PAUPER (Giesbrecht)

PLATE 5, FIGURES 34, 35

Calanus pauper GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 4, sem. 2, p. 331, 1888; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 91, 129, pl. 6, fig. 4; pl. 8, fig. 25, 1892.

Stations 36; 39; 41; 42; 51; 49; 52; 55; 57; 59; 60; 61; 64; 3789; 3901; 4635; 4785; 4926; 5102; 5120; 5129; 5175; 5180; 5185; 5186; 5190; 5196; 5209; 5225; 5228; 5231; 5281; 5340; 5422; 5553; Iloilo Straits, Philippine Islands; Marshall Islands; Fiji Islands. Thirty specimens, including both sexes, were obtained in the surface tow made 5 miles south of Suva Lightship in the Fiji Islands. Sars' drawings of the fifth legs of both the male and female are here reproduced, together with the characteristic spines on the first basipods, which will serve to identify the species. Present in the *Carnegie* and *Siboga* planktons.

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Genus CENTRAUGAPTILUS Sars, 1920

CENTRAUGAPTILUS CUCULLATUS (Sars)

Augaptilus cucullatus Sars, Bull. Mus. Océanogr. Monaco, No. 40, p. 17, 1905b.
Centraugaptilus cucullatus Sars, Rés. camp. sci. Albert de Monaco, No. 69, p. 306, pl. 107, figs. 1–10, 1925.

Stations 4661; 4668; 4669; 4705; 4722. The specimens from these five eastern Pacific stations were identified by Sars as belonging to this species. Though he first placed them in the genus *Augaptilus*, as he had the Monaco specimens in his preliminary report, he later transferred them to the above genus, as he did his Monaco specimens in his final report. These *Albatross* specimens are the first to be reported since the original discovery, as well as the first from the Pacific Ocean.

CENTRAUGAPTILUS HORRIDUS (Farran)

Augaptilus horridus Farran, Fisheries Ireland, Sci. Invest. for 1906, pt. 2, p. 78, pl. 8, fig. 20, 1908.

Stations 3382; 4661; 4667; 5120; 5185; 5287. Established by Farran in 1908 upon specimens taken west of Ireland and placed in the genus *Augaptilus*. The species appears in the list of Monaco plankton, in which it was transferred by Sars to the present genus, but is not found in any of the other lists. It was first reported from the Pacific area by Sewell (1932, p. 326).

CENTRAUGAPTILUS RATTRAYI (T. Scott)

Augaptilus rattrayi T. Scott, Trans. Linn. Soc. London, ser. 2, Zool., vol. 6, pt. 1, p. 36, pl. 2, figs. 25–37, 1894.

Stations 4661; 4664; 4665; 4667; 4681; 4687; 4700; 4705; 4707; 4711; 4713; 4717; 4730; 4734; 4737; 5120; 5185. Established by T. Scott upon a single female from the Gulf of Guinea, it was placed like the preceding species, in the genus *Augaptilus*. Sars then transferred the species to the present genus in the Monaco list, making it the genotype. It was also reported from the Atlantic in the *Carnegie* plankton. The first Pacific record was by Sewell (1932, p. 326), who found it in the Indian Ocean.

Genus CENTROPAGES Krøyer, 1849

CENTROPAGES BRACHIATUS (Dana)

Pontella brachiata Dana, Proc. Amer. Acad. Arts and Sci., vol. 2, p. 27, 1849.
Calanopia brachiata Dana, United States Exploring Expedition, 1838–1842 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1133, 1853; pl. 79, fig. 7, a, b; fig. 8, a, b,; fig. 9 a–g, 1855.

Station 4673. Established by Dana upon specimens from off the Cape of Good Hope and placed first in the genus *Pontella* and after-

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ward in the subgenus *Calanopia*. It was transferred to the present genus by Brady in the *Challenger* plankton and appeared in Rose's portion of the Monaco plankton, but not in the other lists. Dana reported this species off Constitución, Chile, in immense numbers, 40,000 to 50,000, but in the other planktons it was very rare. Sars identified these *Albatross* specimens from the single station off Peru.

CENTROPAGES BRADYI Wheeler

Centropages bradyi Wheeler, Bull. U. S. Fish Comm., vol. 19 (for 1899), p. 174, fig. 12, 1901.

Station 2236. Wheeler based his new species upon four females taken in a surface tow off Marthas Vineyard. It is found in only one of the plankton lists but has been reported by Esterly (1905, p. 172) from the California coast, by Farran (1929, p. 255) from off New Zealand, and by Bigelow (1924, p. 219) from the Gulf of Maine. In the *Challenger* plankton Brady reported it under the specific name *violaceus* from the Philippine Islands and the southern Pacific. Brady's name had already been given to another species by Claus, and so Wheeler changed it to the above.

CENTROPAGES CALANINUS (Dana)

Cyclopsina calanina Dana, Proc. Amer. Acad. Arts and Sci., vol. 2, p. 25, 1849.
Hemicalanus calaninus Dana, United States Exploring Expedition, 1838–1842 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1105, 1853; pl. 78, fig. 10, a, b, 1855.

Stations 7; 9; 10; 12–16; 19; 22–24; 26; 27; 30; 41; 49; 50; 53; 57; 59; 60; 63–67; 71; 73; 79; 80; 82; 3789; 3799; 3878; 4665; 4926; 5196; 5223; 5319; 5611; H. 3782; Fiji Islands. Established by Dana upon specimens collected near El Gran Cocal in the Ellice Islands; present in the *Siboga* and *Carnegie* planktons but not in the Monaco or *Challenger* plankton. Dana recorded the color of living specimens as "bluish, with a reddish tint in the head and abdomen," but in the preserved specimens these colors have long since disappeared.

CENTROPAGES FURCATUS (Dana)

Catopia furcata Dana, Proc. Amer. Acad. Arts and Sci., vol. 2, p. 25, 1849; United States Exploring Expedition, 1838–1842 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1173, 1853; pl. 79, fig 1. a–d, 1855.

Stations 9; 12; 15; 16; 21; 23; 24; 27; 48; 75; 76; 77; 79–81; 3683; 3799; 3800; 3901; 4010; 4635; 4640; 4644; 4652; 5102; 5129; 5133; 5134; 5155; 5175; 5176; 5180; 5185; 5186; 5190; 5196; 5208; 5209; 5223–5226; 5228; 5230–5233; 5262; 5263; 5299; 5319; 5320; 5334; 5338; 5340; 5382; 5386; 5387; 5399; 5415; 5424; 5434; 5437; 5651; Sabtán Island and Iloilo Straits, Philippine Islands; Fiji Islands; Charles

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Island, Galápagos. Established by Dana as the type of a new genus, *Catopia*, it was transferred to the present genus by Brady in the *Challenger* plankton and appears in all the other lists except the Monaco one. It is the most widely distributed species of the genus and often occurs in large numbers.

CENTROPAGES GRACILIS (Dana)

PLATE 22, FIGURE 309

Cyclopsina gracilis DANA, Proc. Amer. Acad. Arts and Sci., vol. 2, p. 25, 1849.

Stations 3829; 5196; 5246. Originally described by Dana from the northern Pacific and later placed by him in the genus *Hemicalanus* (Dana, 1853, p. 1108; 1855, pl. 78, fig. 12 a, b); transferred to the present genus by Giesbrecht. It is included in the *Siboga* plankton and in Rose's portion of the Monaco plankton but not in the others. Four males obtained at station 5246 correspond fully to Giesbrecht's figures of this species. The fifth legs of one of these specimens are shown in figure 309.

CENTROPAGES HAMATUS (Lilljeborg)

Ichthyophorba hamata LILLJEBORG, De Crustaceis ex ordinibus tribus: Cladocera, Ostracoda et Copepoda, in Scania occurrentibus, p. 185, pl. 21, figs. 1–5, 7–9; pl. 26, figs. 9–12, 1853.

Fiji Islands. Thirty-two specimens, including both sexes, were taken in a surface tow at this unnumbered station. This species was found at 26 stations in the Monaco plankton and at 7 in the *Carnegie* plankton, but was not present in the other lists.

CENTROPAGES KRØYERI Giesbrecht

Centropages Kröyeri GIESBRECHT, Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 303, 320, pl. 17, figs. 24, 25, 40, 47; pl. 18, fig. 10; pl. 38, figs. 6, 8, 11, 14, 1892.

Stations 4588; 5262; 5340. Two females were obtained in a surface tow at the first of these stations off the southwest coast of Mexico and a single female at each of the other stations in the Philippines. The species was present at three stations in the Monaco plankton but did not appear in the other lists. It was reported from the Pacific areas by Thompson and Scott (1903, p. 247) and by Sewell (1932, p. 230).

CENTROPAGES ORSINII Giesbrecht

Centropages orsinii GIESBRECHT, Atti Accad Lincei, Rome, ser. 4, vol. 5, sem. 1, p. 811, 1889; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 305, 321, pl. 17, figs. 35, 36, 41, 42; pl. 18, figs. 2, 14, 23; pl. 38, figs. 12, 19, 1892.

Fiji and Marshall Islands. This species did not appear in the

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Carnegie or Monaco planktons but was found at 17 stations in the *Siboga* plankton.

CENTROPAGES TYPICUS Krøyer

Centropages typicus KRØYER, Naturh. Tidsskr. Kjøbenhavn, ser. 2, vol. 2, p. 588, pl. 6, figs. 22–26, 1849.

Stations 3696; 4673; 5340. Well distributed at nearly 150 stations in the Monaco plankton but found only once in the *Carnegie* plankton and not at all in the others. Although it was confined to these three stations in the *Albatross* plankton, over 75 specimens were obtained in a surface tow at the first of the three, located off Honshu, Japan.

CENTROPAGES VIOLACEUS (Claus)

Ichthyophorba violacea CLAUS, Die freilebenden Copepoden, p. 199, pl. 35, figs. 13, 14, 1863.

Stations 6; 9; 12; 23; 34; 36; 39; 41; 43; 53; 55; 57; 59; 63; 65; 75; 81; 3901; 4588; 4644; 4659; 4683–4685; 4688; 4700; 4707; 4721; 4731; 4738; 4741; 5120; 5226; 5227; 5246; 5340; 5424; 5437; Fiji Islands. The list shows that this was one of the most widely distributed species of the genus in the *Albatross* plankton. It was second in abundance in the Monaco plankton, third in the *Carnegie* plankton, but did not appear at all in the Wilkes, *Challenger*, and *Siboga* planktons. Brady recorded in the *Challenger* plankton specimens that he referred to this species, but later they were given a new name, *Centropages bradyi*, by Wheeler (1901, p. 174).

Genus CEPHALOPHANES Sars, 1907

CEPHALOPHANES REFULGENS Sars

Cephalophanes refulgens SARS, Bull. Inst. Océanogr. Monaco, No. 101, p. 15, 1907; Rés. camp. sci. Albert de Monaco, No. 69, p. 154, pl. 43, 1925.

Stations 2; 62; 4681; 4683; 4719; 4730; 4738; 4952. Originally established by Sars upon female specimens from 19 Monaco stations in the temperate Atlantic, it does not appear in any of the other planktons. The male was described and figured by Steuer (1926, p. 182) from the southern Atlantic; the species was also recorded by Farran (1908, p. 49) from the Irish Atlantic Slope. Except for the first and last stations, these *Albatross* specimens were identified by Sars and are a first record from the Pacific Ocean.

Genus CHIRIDIELLA Sars, 1907

CHIRIDIELLA MACRODACTYLA Sars

Chiridiella macrodactyla SARS, Bull. Inst. Océanogr. Monaco, No. 101, p. 8, 1907; Rés. camp. sci. Albert de Monaco, No. 69, p. 50, pl. 16, figs. 1–11, 1925.

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Station 5320. Another species established by Sars in the Monaco plankton upon female specimens from the temperate Atlantic. It was recorded in the *Siboga* plankton from the Malay Archipelago but is not found in the other lists and the male still remains unknown.

Genus CHIRIDIUS Giesbrecht, 1892

CHIRIDIUS ARMATUS (Boeck)

PLATE 22, FIGURE 310

Euchaeta armata BOECK, Forh. Vid. Selsk., Christiania, vol. 14, p. 39, 1872.

Stations 4646; 5185; 5208; 5231; 5285; 5651. Identified from these six *Albatross* stations and from 29 Monaco stations but not found in the other lists. All the Monaco stations were located in the northern Atlantic, but the first of these *Albatross* stations is located off the Galápagos Islands and the second in the Philippines, making the first record from the Pacific. In this species both fifth legs of the male have rudimentary endopods as seen in the figure.

CHIRIDIUS GRACILIS Farran

Chiridius gracilis FARRAN, Fisheries Ireland. Sci. Invest., 1906, pt. 2, p. 30, pl. 2, figs. 1–3, 1908.

Station 5382. Originally described by Farran from the northern Atlantic and afterward reported doubtfully off New Zealand (Farran, 1929, p. 229); also doubtfully reported by Scott in the *Siboga* plankton from the Malay Archipelago. Not found in the other plankton lists and present here in the *Albatross* plankton only in the single Philippine haul listed above. The male is still unknown.

CHIRIDIUS OBTUSIFRONS (Sars)

Chiridius armatus SARS, Norwegian North Polar Exped., vol. 5, Crustacea, p. 64, pl. 17, 1900.
Chiridius obtusifrons SARS, Crustacea of Norway, vol. 4, p. 29, pl. 17, 1902.

Stations 5185; 5227. Sars' type specimens came from the ocean and were at first referred to the species *armatus* but afterward described as new in the Crustacea of Norway. The *Siboga* plankton is the only list in which this species is found, and even there the name is followed by a question mark. However, these two *Albatross* localities are close to the one mentioned in the *Siboga* plankton and indicate that it is really a Pacific form.

Genus CHIRUNDINA Giesbrecht, 1895

CHIRUNDINA STREETSI Giesbrecht

Chirundina streetsi GIESBRECHT, Bull. Mus. Comp. Zool., vol. 25, No. 12, p. 249, pl. 1, figs. 5–10, 1895.

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Stations 27; 3799; 4574; 4671; 4681; 4685; 4687; 4740; 5185; 5227; 5231. This species was reported as rather abundant at 56 Monaco stations and at 16 *Siboga* stations from both the Atlantic and Pacific Oceans. It is also found in the warmer tropical waters as well as the cooler temperate depths, in surface tows and in vertical hauls. At these *Albatross* stations, however, the number of specimens was very limited, sometimes only a single one.

Genus CLAUSOCALANUS Giesbrecht, 1888

CLAUSOCALANUS ARCUICORNIS (Dana)

Calanus arcuicornis DANA, Proc. Amer. Acad. Arts and Sci., vol. 2, p. 12, 1849; United States Exploring Expedition, 1838–1842 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1056, 1853; pl. 72, fig. 7 a, b, 1855.

Stations 2; 4; 5; 8; 9; 19; 20; 22; 23; 25; 26; 29; 36; 39; 45; 49; 53; 57; 60; 62; 63; 65; 66; 75; 77; 79; 81; 82; 236; 3799; 3901; 4574; 4664; 4673; 4707; 4889; 5129; 5208; 5231; 5262; 5263; 5320; 5340; 5396; 5424; 5437; 5651; Fiji Islands. At these *Albatross* stations the number of specimens was comparatively limited, in the *Siboga* plankton they were moderately abundant, in the Monaco plankton very abundant, and in the *Carnegie* plankton taken at nearly every station. Dana's types came from the southern Pacific southwest of the Kermadec Islands.

CLAUSOCALANUS FURCATUS (Brady)

Drepanopus furcatus BRADY, Voyage of H. M. S. *Challenger*, Zool., vol. 8, pt. 23, Copepoda, p. 77, pl. 4, figs. 1, 2; pl. 24, figs. 12–15, 1883.

Stations 9; 12; 19; 23; 26; 30; 32; 35; 41; 47; 52; 64; 65; 70; 71; 75; 3799; 4574; 5233; 5340; 5399. Present in all the plankton lists except the Wilkes, but not so abundant as the preceding species.

Genus CLYTEMNESTRA Dana, 1847

CLYTEMNESTRA ROSTRATA (Brady)

Goniopsyllus rostratus BRADY, Voyage of H. M. S. *Challenger*, Zool., vol 8, pt. 23, Copepoda, p. 107, pl. 42, figs. 9–16, 1883.

Stations 2; 36; 82. Two females were found at station 2 in the temperate Atlantic; the other two stations are in the north Pacific. Otherwise, the species was found at 5 stations in the *Siboga* plankton, all in the west Pacific, and irregularly scattered over the entire Pacific and once southeast of Iceland in the *Carnegie* plankton.

CLYTEMNESTRA SCUTELLATA Dana

Clytemnestra scutellata DANA, Proc. Amer. Acad. Arts and Sci., vol. 1, p. 153, 1847; United States Exploring Expedition, 1838–1842 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1194, 1853; pl. 83, fig. 12 a–f, 1855.

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Stations 71; 3799; 3932; 4037; 4685; 5262; 5301; 5399. A few specimens were found at each of these *Albatross* stations, but from the 62 *Carnegie* stations at which this species was taken over a hundred specimens were obtained.

Genus CONAEA Giesbrecht, 1891

CONAEA GRACILIS (Dana)

PLATE 5, FIGURES 36–46

Antaria gracilis DANA, United States Exploring Expedition, 1838–1842 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1229, 1853; pl. 86, fig. 11 a–d, 1855.

Stations 4723; 4734; 5320; Fiji Islands. First established by Dana in the Wilkes plankton as *Antaria gracilis*, then listed by Giesbrecht in his Naples monograph as *Conaea rapax;* and later by T. Scott (1894, p. 116) from the Gulf of Guinea as *Oncaea gracilis*. It also occurred in the Monaco, *Siboga*, and *Carnegie* lists. The *Albatross* specimens identified by Sars from the first two stations differ in some of the details of the appendages, and as he had made a complete set of pencil drawings they are here reproduced for comparison with those of Giesbrecht and T. Scott.

Genus COPILIA Dana, 1849

COPILIA DENTICULATA Claus

Copilia denticulata CLAUS, Die freilebenden Copepoden, p. 161, pl. 25, figs. 14–20, 1863.

Stations 14; 54; 60; 66; 76; 80; 4611; 5246; 5301; 5320; Gilbert Islands. This species was found at 66 *Carnegie* stations but did not appear in the other planktons.

COPILIA MIRABILIS Dana

Copilia mirabilis DANA, Proc. Amer. Acad. Arts and Sci., vol. 2, p. 40, 1849; United States Exploring Expedition, 1838–1842 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1232, 1853; pl. 86, fig. 14 a–f, 1855.

Stations 15; 3829; 3878; 4009; 4588; 4700; 4716; 4926; 4952; 5102; 5155; 5185; 5186; 5190; 5223; 5230; 5240; 5263; 5319; 5320; 5422; 5436; 5437; 5553; 5611; 5633; 5640; Niuafu Island. This was the type species of Dana's genus. It is present in all the plankton lists except the Monaco and was especially widely distributed in the *Siboga* plankton, where it was reported from 42 stations.

COPILIA QUADRATA Dana

Copilia quadrata DANA, Proc. Amer. Acad. Arts and Sci., vol. 2, p. 40, 1849; United States Exploring Expedition, 1838–1842 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1233, 1853; pl. 86, fig. 15 a–d, 1855.

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Stations 15; 3799; 3829; 3901; 3912; 4009; 4010; 4648; 4659; 4663; 4716; 4926; 4952; 5102; 5120; 5129; 5134; 5175; 5185; 5190; 5223; 5225–5227; 5229; 5234; 5240; 5246; 5262; 5263; 5320; 5340; 5415; 5422; 5488; 5489; 5530; 5553; 5611; 5627; Fiji Islands. This is a little more widely distributed than the preceding species and was reported from 26 *Siboga* and 46 *Carnegie* stations.

COPILIA VITREA (Haeckel)

Hyalophyllum vitreum HAECKEL, Zeitschr. Med. Naturwiss., vol. 1, p. 63, pl. 1, figs. 7–12, 1864.

Stations 5224; 5263; Gilbert Islands. This is the largest species of the genus and is more tropical than the others in distribution. It was found at a single *Siboga* station and at 16 *Carnegie* stations.

Genus CORNUCALANUS Wolfenden, 1905

CORNUCALANUS CHELIFER (Thompson)

Scolecithrix chelifer I. C. THOMPSON, Ann. Mag. Nat. Hist., ser. 7, vol. 12, p. 21, pl. 5, figs. 1–9, 1903.

Station 5185. Established by Thompson in 1903 upon specimens obtained during the cruise of the *Oceana* and placed in the genus *Scolecithrix*. Wolfenden (1905b, p. 21) realized that it did not belong there and created the present genus for its reception, and this has been adopted by subsequent writers. Sars gave complete description and figures in the Monaco plankton, but it does not appear in the other lists. Sewell (1929, p. 177) reported and figured a juvenile male from the Indian Ocean. Two females were obtained at this Philippine station between Panay and Negros Islands.

Genus CORYCAEUS Dana, 1845

CORYCAEUS AGILIS Dana

Corycaeus agilis DANA, Proc. Amer. Acad. Arts and Sci., vol. 2, p. 37, 1849; United States Exploring Expedition, 1838–1842 (Wilkes), vol. 14, pt. 2, Crustacea, pp. 1217, 1218, 1853; pl. 85, fig. 1 a, b, 1855.

Stations 7; 16; 27; 34; 35; 39; 64–66; 68; 70; 71; 75; 80; 82; 2806; 3799; 3878; 3901; 4009; 4010; 4037; 4926; 5102; 5120; 5133; 5134; 5155; 5180; 5186; 5190; 5196; 5223; 5225; 5227; 5234; 5240; 5262; 5263; 5319; 5320; 5338; 5348; 5349; 5382; 5386–5388; 5397; 5422; 5424; 5430; 5437; 5530; 5538; 5553; Fiji Islands; Niuafu Island. In addition to Dana's original description of Pacific specimens, this species was found at 39 stations in the *Carnegie* plankton but it does not appear in the other lists.

CORYCAEUS CATUS F. Dahl

Corycaeus catus F. DAHL, Verh. deutsch. zool. Ges. München, vol. 4, p. 72, 1894b.

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Stations 34–36; 39; 41; 44; 54; 60; 71; 73; 80; 2806; 3829; 4756; 5133; 5186; 5340; 5422; 5424; 5425; Fiji Islands. This species was also in the *Carnegie* plankton but did not appear in the other lists.

CORYCAEUS CLAUSI F. Dahl

Corycaeus clausi F. Dahl, Verh. deutsch. zool. Ges. München, vol. 4, p. 73, 1894b.

Stations 14; 24; 2818; 3782; 4588; Fiji Islands. This is a third species found in the *Carnegie* plankton but not in the other lists.

CORYCAEUS CRASSIUSCULUS Dana

Corycaeus crassiusculus Dana, Proc. Amer. Acad. Arts and Sci., vol. 2, p. 36, 1849; United States Exploring Expedition, 1838–1842 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1214, 1853; pl. 85, fig. 7 a, b, 1855.

Stations 65; 70; 75; 3799; 3878, 3932; 4009; 5357. Established by Dana upon male specimens from the Sulu Sea in the vicinity of the second of these stations.

Dana cited as distinguishing characters the prolonged points on the posterior corners of the third and fourth segments and the contiguity of the conspicilla. He also said that the males had deep red pigment about the mouth and along the ventral surface and that the pigment of the eyes was red.

CORYCAEUS DUBIUS Farran

Corycaeus dubius Farran, Proc. Zool. Soc. London, 1911, p. 292, pl. 12, fig. 7, pl. 14, figs. 5–9.

Stations 14; 39; 75; 82; 4037; 5120; 5155. Established by Farran in 1911 upon a single female taken near Christmas Island, and in 1912 both sexes were fully described and figured by M. Dahl (1912, p. 71). It appears only in the *Carnegie* plankton, where it was found in both the Atlantic and Pacific.

CORYCAEUS FLACCUS Giesbrecht

Corycaeus flaccus Giesbrecht, Atti Accad. Lincei, Rome, ser. 4, vol. 7, sem. 1, p. 480, 1891; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 659, 674, pl. 51, figs. 10, 11, 1892.

Stations 2; 13; 24; 41–43; 55; 59; 60; 63–66; 75; 3799; 3878; 4009; 4037; 4644; 4707; 5246; 5437; Fiji Islands. Present at 27 Monaco, 39 *Carnegie*, and 3 *Siboga* stations but not appearing among Dana's or Brady's species.

CORYCAEUS FURCIFER Claus

Corycaeus furcifer Claus, Die freilebenden Copepoden, p. 157, pl. 24, figs. 7–12, 1863.

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Stations 30; 59; 60; 3799; 5246. Taken at 20 *Siboga*, 4 Monaco, and 13 *Carnegie* stations but not appearing in the Wilkes or *Challenger* lists.

CORYCAEUS GIESBRECHTI F. Dahl

Corycaeus giesbrechti F. DAHL, Verh. deutsch. zool. Ges. München, vol. 4, p. 72, 1894b.

Station 24. Established by F. Dahl upon specimens from the temperate Atlantic and afterward reported in the Carnegie plankton, by M. Dahl (1912, p. 88) from the Pacific, and by Sewell (1924, p. 803) from the Indian Ocean. It is thus widely distributed but nowhere abundant.

CORYCAEUS LATUS Dana

Corycaeus latus DANA, Proc. Amer. Acad. Arts and Sci., vol. 2, p. 38, 1849; United States Exploring Expedition 1838–1842 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1221, 1853; pl. 86, figs. 3 a–e, 1855.

Stations 3822; 3829; 3878; 4009; 4010; 4037; 4588; 5120; 5129; 5175; 5176; 5180; 5186; 5190; 5208; 5209; 5223; 5225; 5229; 5234; 5386; 5388; 5399; 5434; 5437; 5530; 5601; 5651; Sabtán Island, Philippine Islands. Established by Dana upon specimens from the tropical Atlantic and reported by Rose in the Monaco plankton, the species does not appear in the other lists. The present is the first record from the Pacific and indicates that the species is more abundant in that ocean. Dana said (1853, p. 1222) that the pigment of the large eyes extended backward on the underside of the cephalothorax, but this could not be verified in any of these preserved specimens.

CORYCAEUS LAUTUS Dana

Corycaeus lautus DANA, Proc. Amer. Acad. Arts and Sci., vol. 2, p. 37, 1849; United States Exploring Expedition, 1838–1842 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1219, 1853; pl. 85, fig. 12 a–e, 1855.

Stations 2; 14; 59; 60; 63; 66; 75; 3782; 3799; 3829; 4926; 5133; 5155; 5190; 5262; 5319; 5320; 5349; 5412; 5437; 5530; 5601; Niuafu Island. Established upon specimens from the tropical Pacific and appearing in the Monaco and *Carnegie* planktons but not in the *Siboga* or *Challenger* lists.

CORYCAEUS LIMBATUS Brady

Corycaeus limbatus BRADY, Voyage of H. M. S. *Challenger*, Zool., vol. 8, pt. 23, Copepoda, p. 114, pl. 49, figs. 18–22, 1883.

Stations 65; 70; 71; 3799; 3829; 3901; 3980; 4009; 4037; 4637; 5208; 5225; 5231; 5240; 5246; 5262; 5263; 5301; 5320; 5424; 5434; Sabtán Island, Philippine Islands; Fiji Islands. Reported from 13 Monaco and 38 *Carnegie* stations but not found in the *Siboga* or *Challenger* plankton.

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CORYCAEUS LONGISTYLIS Dana

Corycaeus longistylis DANA, Proc. Amer. Acad. Arts and Sci., vol. 2, p. 36, 1849; United States Exploring Expedition, 1838–1842 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1212, 1853; pl. 85, fig. 5 a-d, 1855.

Stations 24; 26; 30; 31; 39; 41–44; 52; 55; 57; 59; 60; 62; 63; 65–67; 3799; 3800; 3829; 3878; 3901; 4009; 4010; 4683; 4714; 4731; 4926; 5120; 5129; 5133; 5134; 5180; 5185; 5190; 5223; 5227; 5229; 5240; 5246; 5262; 5301; 5308; 5319; 5320; 5334; 5338; 5340; 5348; 5415; 5424; 5434; 5437; 5489; 5530; 5646; 5651; Sabtán Island, Philippine Islands; Fiji Islands; Niuafu Island. Reported from 13 *Siboga* and 57 *Carnegie* stations but not present in the Monaco or the *Challenger* plankton.

CORYCAEUS LUBBOCKII Giesbrecht

Corycaeus lubbockii GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 7, sem. 1, p. 481, 1891; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 660, 674, pl. 51, figs. 51, 57, 58, 1892.

Stations 10; 24; 46; 48; 55; 57; 59; 60; 62; 63; 65; 4009; 5437. Found at 5 *Siboga* and 2 *Carnegie* stations but not present in the other lists.

CORYCAEUS OVALIS Claus

Corycaeus ovalis CLAUS, Die freilebenden Copepoden, p. 158, 1863.

Stations 24; 30; 63; 65; 68; 70; 71; 3789; 5129; 5263; 5320; 5334; 5338; 5382; 5386; 5415; 5424; 5437; 5651; 5653; Iloilo Straits, Philippine Islands; Fiji Islands. Present at 20 Monaco and 15 *Carnegie* stations but not found in the other lists. M. Dahl (1912, p. 96) claimed it as a typical Mediterranean form, yet the above record shows it to be also well distributed in the Pacific.

CORYCAEUS PACIFICUS F. Dahl

Corycaeus pacificus F. DAHL, Verh. deutsch. zool. Ges. München, vol. 4, p. 73, 1894b.

Stations 41; 65; 3901; 3981; 5120; 5134; 5340; 5348; 5399; 5651; Niuafu Island. Established by F. Dahl and later more completely described and figured by M. Dahl (1912, p. 103); it does not appear in any of the plankton lists except the *Carnegie*, but it has been reported from the Indian as well as the Pacific Ocean.

CORYCAEUS PUMILUS M. Dahl

Corycaeus pumilus M. DAHL, Ergebnisse der Plankton-Expedition der Humboldt-Stiftung, vol. 2, Die Copepoden, p. 91, pl. 12, figs. 21–28, 1912.

Stations 15; 34; 35; 41; 66; 71; 3829; 3901; 4037; 5120; 5134; 5175; 5176; 5186; 5225; 5226; 5262; 5263; 5320; 5340; 5388; 5424;

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5507; Iloilo Straits, Philippine Islands. Described by M. Dahl as a coastal form from the Bismarck Archipelago and New Guinea. Widely distributed over the Pacific Ocean in the *Carnegie* plankton but not appearing in the other lists.

CORYCAEUS ROBUSTUS Giesbrecht

Corycaeus robustus GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 7, sem. 1, p. 480, 1891; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 660, 673, pl. 51, figs. 38, 42, 1892.

Stations 39; 64; 66; 3829; 3878; 3901. Included by Brady in the *Challenger* plankton under the name *C. venustus* Dana, on the basis of specimens from the Philippine Islands. The species was taken by the *Siboga* at 19 stations in the tropical Pacific and by the *Carnegie* at widely scattered stations.

CORYCAEUS SPECIOSUS Dana

Corycaeus speciosus DANA, Proc. Amer. Acad. Arts and Sci., vol. 2, p. 38, 1849; United States Exploring Expedition, 1838–1842 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1220, 1853; pl. 86, fig. 1 a-d, 1855.

Stations 15; 24; 27; 33; 41; 43; 44; 48; 49; 52; 53; 57; 64–66; 70; 75–77; 80; 2195; 2806; 3782; 3789; 3799; 3800; 3829; 3878; 3932; 4009; 4010; 4190; 4731; 4756; 4926; 5102; 5120; 5129; 5133; 5155; 5175; 5180; 5186; 5190; 5196; 5209; 5223; 5225; 5229–5231; 5240; 5246; 5247; 5262; 5263; 5319; 5320; 5334; 5338; 5348; 5382; 5386; 5387; 5415; 5422; 5434; 5484; 5507; 5530; 5578; Iloilo Straits, Philippine Islands; Fiji Islands; Gilbert Islands. Found also at 1 *Challenger*, 13 Monaco, 37 *Siboga*, and 62 *Carnegie* stations and therefore is well distributed in all oceans.

CORYCAEUS SUBTILIS M. Dahl

Corycaeus subtilis M. DAHL, Ergebnisse der Plankton-Expedition der Humboldt-Stiftung, vol. 2, Die Copepoden, p. 80, pl. 8, figs. 9–16, 1912.

Stations 3799; 3829. Originally established upon specimens from Zanzibar and the Bismarck Archipelago, it does not appear in any of the plankton lists.

CORYCAEUS TYPICUS (Krøyer)

Agetus typicus KRØYER, Naturh. Tidssk., Kjøbenhavn, ser. 2, vol. 2, p. 603, pl. 6 figs. 27–29, 1849.

Stations 61–63; 66; 70; 71; 75; 76; 3799; 3901; 5223; 5246; 5320; Sabtán Island, Philippine Islands; Fiji Islands; Niuafu Island. This species was recorded from 19 Monaco and 77 *Carnegie* stations but is not included in the other lists. Krøyer made this species the type of a new genus, *Agetus*, but it evidently belongs to Dana's genus

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Corycaeus; therefore Krøyer's name becomes a synonym. Fortunately it fits into Dana's genus so well that its specific name does not seem at all out of place.

CORYCAEUS VITREUS Dana

Corycaeus vitreus DANA, Proc. Amer. Acad. Arts and Sci., vol. 2, p. 37, 1849; United States Exploring Expedition, 1838–1842 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1216, 1853; pl. 85, fig. 9 a-d, 1855.

Station 4009. Established by Dana upon a single male captured east of the Taumotu Islands in the tropical Pacific. It does not appear in any of the plankton lists but was described and figured in detail by M. Dahl (1912, p. 25). The female still remains unknown.

Genus CRYPTOPONTIUS Giesbrecht, 1899

CRYPTOPONTIUS BREVIFURCATUS Giesbrecht

Cryptopontius brevifurcatus GIESBRECHT, Fauna und Flora des Golfes von Neapel, monogr. 25, p. 109, pl. 1, fig. 7; pl. 8, figs. 1–12, 1899.

Station 2396. Identified from this single station in the Gulf of Mexico; fully described by Sars (1915, p. 120). It is not found in any of the plankton lists, since it is a semiparasitic form and can be captured only when it leaves its host and swims about freely in the tow, a circumstance that apparently happens very rarely.

Genus CYMBASOMA I. C. Thompson, 1888

CYMBASOMA LONGISPINOSUM (Bourne)

Monstrilla longispinosa BOURNE, Quart. Journ. Micr. Sci., ser. 2, vol. 30, p. 575, pl. 37, figs. 1–4, 10, 1890.

Caldera Bay anchorage, west coast of Mindanao, Philippine Islands. The net was set in the tidal current at the gangway of the steamer for 20 minutes, and in the large resultant catch were included five species of Monstrilloida. The present species was established by Bourne upon specimens obtained in the English Channel. Both sexes were afterward fully described and figured by Sars (1921, p. 24).

CYMBASOMA RIGIDUM I. C. Thompson

Cymbasoma rigidum THOMPSON, Journ. Linn. Soc. London, Zool., vol. 20 (1890), p. 154, pl. 13, 1888.

Stations 5133, 5320; Caldera Bay anchorage, west coast of Mindanao, Philippine Islands. This was the species designated by Thompson to serve as the type of his new genus *Cymbasoma*. The generic name was afterward withdrawn in favor of Dana's genus *Monstrilla*, but when it became necessary to divide *Monstrilla* into two closely allied genera Thompson's name was restored. As in the case of the preceding species both sexes were fully described and figured by Sars (1921, p. 21).

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Genus DACTYLOPUSIA Norman, 1903

DACTYLOPUSIA VULGARIS Sars

Dactylopusia vulgaris Sars, Crustacea of Norway, vol. 5, p. 128, pl. 79, fig. 1, 1905.

Two females of this species were found in a small vial containing a printed *Albatross* label, which, unfortunately, carried no other data. This is a common and widely distributed harpacticoid, though not in any of the plankton lists, and might well be included in the plankton picked up at any of the anchorages.

Genus DISSETA Giesbrecht, 1889

DISSETA MAXIMA Esterly

Disseta maxima Esterly, Univ. California Publ. Zool., vol. 6, No. 14, p. 330, pl. 29, figs. 54, 58; pl. 30, fig. 79, 1911.

Stations 5320; 5437. Established by Esterly upon a few female specimens from off the coast of southern California and not found in any of the plankton lists. The male still remains unknown, and the species is very limited in its distribution.

DISSETA PALUMBOI Giesbrecht

Plate 21, Figure 296

Disseta palumbii Giesbrecht, Atti Accad. Lincei, Rome, ser. 4, vol. 5, sem. 1, p. 812, 1889; Fauna and Flora des Golfes von Neapel, monogr. 19, p. 369, pl. 29, figs. 2, 8, 14, 19, 23–25, 27; pl. 38, fig. 44, 1892.

Stations 2; 13; 18; 4652; 4661; 4663; 4665; 4667; 4669; 4673; 4676; 4679; 4687; 4705; 4707; 4711; 4717; 4719; 4722; 4730; 4793; 5129; 5185; 5225; 5231; 5320. Established by Giesbrecht upon a single female from the tropical Pacific, the male was afterward described and figured by A. Scott in the *Siboga* plankton. Twenty-five specimens were identified by Sars from the first 19 of these *Albatross* stations; earlier he reported the species from 54 stations in the Monaco plankton. Neither Scott nor Sars noted the tripartite spine on the second exopod segment of the fifth leg in the female. This was figured by Giesbrecht and noted by Sewell (1932, p. 309). As found in these *Albatross* specimens, it is dark in color and highly chitinized and stands up at right angles to the surface of the leg, making a good identifying character.

DISSETA SCOPULARIS (Brady)

Plate 6, Figures 47–50

Leuckartia scopularis Brady, Voyage of H. M. S. *Challenger*, Zool., vol. 8, pt. 23, Copepoda, p. 51, pl. 14, figs. 1–5, 1883.

Stations 4681; 4705; 4722; 4730; 4740. Established by Brady in the *Challenger* plankton upon "two or three imperfect specimens taken

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between Japan and Honolulu" and placed in the genus "*Leuckartia* (?)." Another imperfect male was taken in the *Siboga* plankton south of Ceram in the Malay Archipelago and was described and figured as *Disseta scopularis* by Scott. These are all the specimens hitherto obtained. Sars identified 14 copepods from the six *Albatross* stations listed above as a new species of *Disseta*. He did not, however, examine the appendages in detail, and as soon as the fifth legs of the male were carefully observed it became apparent that the specimens corresponded to those described by Brady and Scott. Since the earlier specimens were mutilated and confined to the male sex, a full description of both sexes is given.

Female.—Metasome an elongated ellipse nearly three times as long as wide, with a small rounded knob at the center of the forehead above the rostrum. The latter is short, lamellar, and tipped with two slender filaments and is entirely concealed in side view by the bases of the first antennae. The posterior corners of the thorax are bluntly rounded and project backward a little on either side of the genital segment.

Urosome 4-segmented and slender, one-third as wide as the metasome and half as long if the caudal rami are included. The genital segment is one-half longer than wide with straight sides and the anal segment is fused with the caudal rami. The left caudal ramus is longer than the right and each is armed with a long naked seta and three plumose setae. The naked seta on the left ramus is longer than the entire body, a considerable median portion having been cut out in the figures.

The first antennae are slender and reach four segments beyond the tips of the caudal rami. The endopod of the second antenna is shorter than the exopod, and both rami are armed with unusually long and slender setae. On the chewing blade of the mandible the three outer teeth are very much larger than the series of 10 or 12 inner ones. The second maxilla has six inner lobes, each tipped with three to five setae. The maxilliped and the first four pairs of legs are similar to those of *palumboi*, but the fifth legs are quite different. There is a much greater inequality in size between the two rami, the exopod being four times as long as the endopod. The end segment on the exopod is more than twice as long as wide, with two outer spines and one inner seta. The basal segment of the endopod has one inner seta, the middle segment two inner setae, and the end segment three inner, two terminal and two outer setae. Total length 10 to 11 mm.

Male.—A little smaller than the female with the same general proportions except that the urosome is 5-segmented. The anal segment is fused with the caudal rami, and the latter show the same asymmetry

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as in the female. The first antenna on the left side is geniculate and longer than the right one, with the terminal portion 4-segmented. The other appendages are like those of the female, except the fifth legs shown in figure 50. The basipods of these legs are considerably enlarged and the second segment in each leg has on its posterior surface a laminate process tipped with a dense fringe of fine hairs which completely covers the basal endopod segment. These endopods are 3-segmented, the left one a trifle the longer and its end segment with six setae while the end segment of the right endopod has five setae. The middle segments each have a single seta, and these, as well as the setae on the end segments, extend straight across and overlap those on the opposite leg. The proximal segment of each exopod has a small spine at its outer distal corner, and the second segment has a stout curved spine on its inner margin at the base. On the right leg the inner distal corner of this second segment is protruded into a blunt process covered with fine hairs. The end segment is tipped with a couple of spines and carries on its inner margin a semicircular transparent pad that covers the bases of the terminal spines and extends back to the hairy process of the second segment. The end segment of the left exopod has two spines on its inner margin and is tipped with a long stout spine bent near its base and acuminate at its tip. Total length 9 to 9.50 mm.

Allotype female.—U.S.N.M. No. 70744; station 4722, latitude 9°31′ S., longitude 106°30′ W., Galápagos to Paumotu Islands.

Remarks.—The exceptional inequality in the size of the two rami of the fifth legs in the female and the structural details of the fifth legs of the male are the distinguishing characters of this species. On comparing figure 50 of plate 4 with figure 9, plate 42, of the *Siboga* report it will be evident that the fifth legs of Scott's single male were scarcely injured at all. On the contrary, Brady's specimen was badly mutilated and owing to the separation of the two legs right and left have been transposed both in the description and in the labels of the figures.

Genus DREPANOPUS Brady, 1883

DREPANOPUS FORCIPATUS Giesbrecht

Drepanopus forcipatus Giesbrecht, Atti. Accad. Lincei, Rome, ser. 4, vol. 4, sem. 2, p. 335, 1888; Fauna und Flora des Golfes von Neapel, monogr. 19, p. 201, pl. 10, figs. 23–25, 27–30; pl. 36, figs. 36–38, 1892.

[Station 2770. Almost coincidental with the publication of Giesbrecht's description of this rare genus and species from both coasts of southern South America (lat. 45° S. and 49° S.) the *Albatross* secured some 500 female specimens in latitude 48° S., off the Argentine coast. The *Albatross* specimens, which may have been deter-

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mined by Sars, failed of record in the Wilson manuscript. Their identification has been verified by Mrs. Mildred S. Wilson (*vide* footnote 1, p. vii). The taking of some 150 specimens, practically all females, in a dredge haul made in 20–25 meters in West Cumberland Bay, South Georgia, is reported by Pesta (1930, p. 101).—W. L. S.]

Genus DYSGAMUS Steenstrup and Lütken, 1861

DYSGAMUS ARIOMMUS Wilson

Dysgamus ariommus WILSON, Proc. U. S. Nat. Mus., vol. 31, p. 713, pl. 20, figs. 62–70, 1907.

Stations 3829; 5228. Two males were taken in the tow at this second station south of Romblon Island in the Philippines and a third at the first station south of the Hawaiian Islands, all three swimming freely. The species does not appear in any of the lists, and these are the first specimens to be obtained since the original discovery. In discussing the commensal and parasitic copepods of the *Siboga* plankton, Dr. Leigh-Sharpe (1934, p. 28) described seven specimens that he referred to Brady's species *murrayi*, which Brady had placed in the genus *Nogagus*. Brady's description in the *Challenger* report was very meager, and in his single figure the first two pairs of legs were entirely lacking. Dr. Leigh-Sharpe's excellent figures supplied these and many other missing details, but he made the present species *ariommus* a synonym of *murrayi*, which his own figures proved to be impossible. In *murrayi* the endopods of the first three pairs of legs are 1-segmented, the genital segment has a pair of large leg rudiments, and in his own words, "there are two furcae one behind the other." In *ariommus* the endopods of all four pairs of legs are 2-segmented, there are no leg rudiments on the genital segment, and the furca is certainly single. It may be added that none of the other appendages show correspondence in detail and such a total lack of accord in specific characters effectively prohibits any idea of synonymy suggested by general appearance.

DYSGAMUS PACIFICUS, new species

PLATE 6, FIGURES 51–60

Stations 3683; 3829; 4010; H. 3789. About 20 males were taken in a surface tow at station H. 3789 north of the Marquesas Islands on September 9, 1899. Single males were obtained at each of the other stations except station 3683, at which 3 were taken.

Male.—Carapace 55 percent of the entire length and five-sixths as wide as long, with the dorsal pattern of grooves shown in figure 51. Frontal plates prominent and separated by a narrow median incision; lateral lobes with their bluntly rounded ends turned inward, just

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equaling in length the median lobe. Free fourth segment with strongly convex sides and as wide as the posterior end of the median carapace lobe. Genital segment barrel-shaped and nearly as wide as the fourth segment, with no trace of leg rudiments. Abdomen 2-segmented, the segments the same width but the anal segment longer than the basal. Caudal rami suborbicular, inserted in the reentrant corners of the anal segment and scarcely projecting behind it.

First antenna rather stout, with short setae; basipod of the second antenna with a stout posterior spine acute at its tip, the terminal claw bent abruptly near its center. First maxilla simple, its inner margin an S-curve; second segment of second maxilla longer than the basal segment, with a small spine distal to the center of its inner margin, the inner terminal seta twice as long as the outer. Maxilliped with the basal segment much swollen and armed on its inner surface with a stout spine and a corrugated ridge against which the powerful and strongly curved terminal claw shuts. Furca[6] H-shaped, the lateral arms enlarged at their bases, the central crossbar quite slender. The four pairs of legs are biramose, each ramus 2-segmented with spines and setate as shown in figures 57 to 60. Attention is called to the abnormal seta on the inner margin of the basal segment of the second leg. Total length 3.82 mm. Carapace 2 mm. long, 1.85 mm. wide.

Type.—U.S.N.M. No. 70752; station H3789, Cape Martin, Nukuhiva Island, N. 30° E., distance 6½ miles.

Remarks.—The distinctive characters of this species appear in every one of the appendages but especially in the arrangement of the spines and setae on the four pairs of legs.

Genus ECTINOSOMA Boeck, 1864

ECTINOSOMA CURTICORNIS Boeck

Ectinosoma curticornis Boeck, Forh. Vid. Selsk., Christiania, vol. 14, p. 45, 1872.

Station 4663. Two females of this small harpactid were found in a surface tow at this station off the Peruvian coast. It is not included in any of the other plankton lists.

Genus EUAETIDEUS Sars, 1925

EUAETIDEUS BRADYI (A. Scott)

Plate 7, Figures 70, 71

Aetideus bradyi A. Scott, Copepoda of the *Siboga*-Expedition, monogr. 29a, pt. 1, p. 38, pl. 5, figs. 1–12, 1909.

[6] The name furca is used to designate this appendage of parasitic copepods and hence cannot be rightly applied to the caudal rami of pelagic forms.

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Stations 4758; 5120; 5185; 5190; 5320. Established by A. Scott as *Aetideus bradyi* in the *Siboga* plankton, but in the Monaco plankton transferred by Sars to his new genus *Euaetideus* together with other specimens "Obtenue pendant l'Expedition de l'*Albatross* dans l'Océan Pacifique, mais non encore décrite." At first Sars regarded these specimens as a new species, the third for his new genus, and made drawings of them labeled with a new specific name. But afterward he evidently changed his decision, drew a line through the new name, and wrote above it the name of the present species. This explains the above quotation from the Monaco plankton and also the fact that no third species of the new genus has ever appeared. All Scott's specimens were females and so were those that Sars made the type species of his new genus. The *Albatross* collections however include males as well as females, and the former sex is here described for the first time, from Station 4758.

Male.—Head fused with the first segment into an elongate cephalothorax like that of the female. A similar hard and horny rostrum is present, but there is no knoblike frontal projection or any crest. The last thoracic segment is produced into chitinized spines, which reach the posterior margin of the first abdominal segment and are curved slightly outward. The urosome is 4-segmented; the genital segment is one-half wider than long; the middle abdominal segment is longer than either of the other two. The caudal rami are longer than the anal segment and slightly divergent, three times as long as wide, each with four plumose and one appendicular setae.

The antennae, mouth parts, and first four pairs of legs are like those of the female. Only one fifth leg, the left, is present, as in the males of the genus *Aetideus*, and this leg is uniramose and 5-segmented. The third segment is the longest and the terminal segment the shortest, and the only armature is four or five minute filose setae on the end segment. Total length 1.50 mm. Metasome 1.40 mm. long, 0.56 mm. wide.

Allotype male.—U.S.N.M. No. 70757; station 4758: latitude 52°02′ N., longitude 132°53′ W., off Queen Charlotte Islands.

Remarks.—This is the first male to be reported for Sars' new genus, and since the rostrum is fully as massive as in the female and the spines at the posterior corners of the metasome are half as long as the urosome it fully supplements the distinctive characters of the genus and helps to validate its separation from the genus *Aetideus*. The species was reported in the *Carnegie* list from the eastern Pacific.

EUAETIDEUS GIESBRECHTI (Cleve)

Aetideus giesbrechti CLEVE, Marine investigations in South Africa, vol. 3 (1905), Copepoda, p. 185, 1904.

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Stations 7; 15; 470; 3799; 4687; 5120; 5129; 5185; 5227; 5246; Fiji Islands. This species is the type of the genus *Euaetideus* established by Sars in the Monaco plankton; specimens from three of these *Albatross* stations were identified by him. It was found at seven stations in the Monaco plankton, nine stations in the *Siboga* plankton, and was reported from the Pacific in the *Carnegie* plankton.

Genus EUAUGAPTILUS Sars, 1920

EUAUGAPTILUS ANGUSTUS (Sars)

Augaptilus elongatus SARS, Bull. Mus. Océanogr. Monaco, No. 40, p. 13, 1905b.
Euaugaptilus angustus SARS, Rés. camp. sci. Albert de Monaco, No. 69, p. 281, pl. 91, 1925.

Stations 4671; 4691; 4695; 4717; 4719; 5320. Identified by Sars from the first 5 of these 6 *Albatross* stations and from 16 in the Monaco plankton but not appearing in the other lists. It was first reported from the Pacific area by Sewell (1932, p. 322).

EUAUGAPTILUS BULLIFER (Giesbrecht)

Augaptilus bullifer GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 5, sem. 1, p. 813, 1889; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 400, 413, pl. 28, figs. 6, 21, 24; pl. 39, fig. 46, 1892.

Stations 4687; 4717; 4732; 4740. Identified by Sars from these *Albatross* stations in the eastern Pacific and from 20 stations in the Monaco plankton; also found at 2 *Siboga* stations.

EUAUGAPTILUS ELONGATUS (Sars)

Augaptilus elongatus SARS, Bull. Mus. Océanogr. Monaco, No. 40, p. 13, 1905b.
Euaugaptilus elongatus SARS, Rés. camp. sci. Albert de Monaco, No. 69, p. 270, pl. 84, 1925.

Stations 5225; Fiji Islands. Established by Sars from 21 stations in the Monaco plankton and reported by Farran (1908, p. 71) as *Augaptilus elongatus* off the coast of Ireland, but not occurring in the other plankton lists. All the previous specimens have been taken from the Atlantic Ocean, and this is the first Pacific record.

EUAUGAPTILUS FACILIS (Farran)

Augaptilus facilis FARRAN, Fisheries Ireland, Sci. Invest. for 1906, pt. 2, p. 73, pl. 3, figs. 23, 24; pl. 8, figs. 1–6, 1908.

Station 4717. Identified by Sars from this single station near the Galápagos Islands, and in the Monaco plankton from a single station near the Canaries, but not appearing in the other lists. Farran's original specimens and others reported on by Wolfenden (1911, p. 343) were all from the Atlantic. Sewell's record from Indian waters (1932, p. 322) may be the first Pacific one, as these specimens are prob-

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ably the ones mentioned by Sars in the Monaco report as coming from the Pacific.

EUAUGAPTILUS FILIGERUS (Claus)

Hemicalanus filigerus CLAUS, Die freilebenden Copepoden, p. 179, 1863.

Stations 7; 2219. Identified by Sars from the first of these *Albatross* stations in the Atlantic and from 16 Monaco stations also in the Atlantic; one specimen reported at each of 5 stations in the *Siboga* plankton.

EUAUGAPTILUS GIBBUS (Wolfenden)

Augaptilus gibbus WOLFENDEN, Journ. Marine Biol. Assoc. United Kingdom, new ser., vol. 7, No. 1, p. 122, 1904.

Stations 1; 4427. A single female was identified from this station in the lesser Antilles. Sars reported the species from four Monaco stations, but it does not appear in any of the other lists.

EUAUGAPTILUS HECTICUS (Giesbrecht)

PLATE 21, FIGURES 297, 299

Augaptilus hecticus GIESBRECHT, Atti. Accad. Lincei, Rome, ser. 4, vol. 5, sem. 1, p. 814, 1889; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 400, 414, pl. 1, fig. 3; pl. 27, fig. 30; pl. 28, figs. 5, 9, 16, 30, 33, 37; pl. 29, fig. 18; pl. 30, fig. 45, 1892.

Stations 4695; 5451. Originally established by Giesbrecht upon specimens obtained in the Mediterranean and placed in the genus *Augaptilus*. Afterward reported by Farran (1929, p. 269) from the southern Pacific off New Zealand and transferred to Sars' genus *Euaugaptilus*. The first of the above *Albatross* stations was off Easter Island in the southern Pacific, while the second station was east of Luzón in the Philippines. This species appears only in the *Siboga* plankton list.

EUAUGAPTILUS LATICEPS (Sars)

Augaptilus laticeps SARS, Bull. Mus. Océanogr. Monaco, No. 40, p. 11, 1905b.
Euaugaptilus laticeps SARS, Rés. camp. sci. Albert de Monaco, No. 69, p. 264, pl. 80, 1925.

Stations 4646; 4652; 4657; 4663; 4664; 4671; 4676; 4679; 4687; 4695; 4717; 5129; 5287. Identified by Sars from 9 of these *Albatross* stations and from 35 stations in the Monaco plankton, but not appearing in any of the other lists. Reported from the Indian Ocean by Sewell (1932, p. 321).

EUAUGAPTILUS LONGIMANUS (Sars)

Augaptilus longimanus SARS, Bull. Mus. Océanogr. Monaco, No. 40, p. 17, 1905b.
Euaugaptilus longimanus SARS, Rés. camp. sci. Albert de Monaco, No. 69, p. 282, pl. 92, 1925.

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Stations 4681; 4687; 4717; 4730; 4734. Established by Sars in the Monaco plankton upon specimens of both sexes from 30 stations but not present in the other lists. All his specimens came from around the Azores and the Canaries in the temperate Atlantic. He also identified these *Albatross* specimens from the five stations above in the eastern Pacific, the first to be reported since his original discovery, and the first from that ocean.

EUAUGAPTILUS MAGNUS (Wolfenden)

Augaptilus magnus WOLFENDEN, Journ. Marine Biol. Assoc. United Kingdom, new ser., vol. 7, No. 1, p. 122, 1904.

Stations 4671; 4676; 4679; 4717. Wolfenden's original specimens came from the west coast of Ireland and he later reported others from the southern Atlantic. Sars reported the species from 50 Monaco stations and gave a full account of both sexes with figures in his Monaco report, but it does not appear in the other lists.

EUAUGAPTILUS NODIFRONS (Sars)

Augaptilus nodifrons SARS, Bull. Mus. Océanogr. Monaco, No. 40, p. 13, 1905b.
Euaugaptilus nodifrons SARS, Rés. camp. sci. Albert de Monaco, No. 69, p. 267, pl. 82, 1925.

Stations 4655; 4661; 4664; 4665; 4667–4669; 4676; 4679; 4705; 4715; 4717; 4721; 4722; 5185; 5231. Established by Sars upon specimens of both sexes from 27 Monaco stations and fully described and figured in his Monaco report. He also identified the *Albatross* specimens from 14 of the 16 listed stations. This is one of very few instances where the same species of *Euaugaptilus* was found at successive stations in both *Albatross* and Monaco planktons. [This clears up the matter of the Pacific record which has puzzled authors since Sars' statement in the Monaco report that the known distribution was "Océan Atlantique et Pacifique" (see Sewell 1932, p. 316). Sewell's observation that Sars had presumably recognized this species in some other collection is shown to be true. The male was found in the Indian Ocean by Sewell.—M. S. W.]

EUAUGAPTILUS OBLONGUS (Sars)

Augaptilus oblongus SARS, Bull. Mus. Océanogr. Monaco, No. 40, p. 11, 1905b.
Euaugaptilus oblongus SARS, Rés. camp. sci. Albert de Monaco, No. 69, p. 266, pl. 81, 1925.

Stations 4646; 4655; 4663; 4668; 4671; 4673; 4679; 4683; 4685; 4700. Established by Sars upon specimens from 27 Monaco stations in both the Atlantic and Pacific. Sars also identified the species from 8 of these 10 *Albatross* stations. Otherwise reported only by Sewell (1932, p. 322) from Indian waters.

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EUAUGAPTILUS PALUMBOI (Giesbrecht)

Augaptilus palumbii GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 5, sem. 1, p. 813, 1889; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 400, 413, pl. 27, fig. 32; pl. 28, figs. 3, 15, 17; pl. 39, figs. 39, 50, 1892.

Stations 9; 4652; 4673; 4687; 4705; 4708; 4722; 4730. Giesbrecht's type specimens came from the eastern Pacific southwest of the Galápagos Islands. Sars identified the species from 3 Monaco and from these eight *Albatross* stations; A. Scott found it at six *Siboga* stations. It does not appear in the other lists, but Wolfenden (1911, p. 340) has reported it as *Augaptilus palumboi* from the Antarctic, and so it is well distributed, although the number of specimens obtained is quite small.

EUAUGAPTILUS RIGIDUS (Sars)

PLATE 6, FIGURE 61; PLATE 7, FIGURE 62

Augaptilus rigidus SARS, Bull. Inst. Océanogr. Monaco, No. 101, p. 21, 1907.
Euaugaptilus rigidus SARS, Rés. camp. sci. Albert de Monaco, No. 69, p. 296, pl. 103, 1925.

Station 4687. Two females were identified by Sars from this *Albatross* station and a single female from the Monaco plankton. The latter specimen upon which the species was founded had lost most of the setae upon its caudal rami, and so his excellent description and figures were lacking in this detail. He made pencil sketches of these perfect *Albatross* specimens, and they are reproduced here to supplement his Monaco figures.

EUAUGAPTILUS SQUAMATUS (Giesbrecht)

Augaptilus squamatus GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 5, sem. 1, p. 814, 1889; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 400, 413, pl. 28, figs. 1, 12, 18, 22, 25, 34; pl. 39, fig. 38, 1892.

Stations 4607; 4652; 4659; 4667; 4671; 4679; 4681; 4687; 4700; 4707; 4711; 4717; 4719; 4721; 4722; 4734; 5185. Giesbrecht's type specimens came from north of the Marshall Islands in the tropical Pacific, and these *Albatross* stations are also in the Pacific. The Monaco stations from which it was identified by Sars, on the contrary, were all in the northern Atlantic.

Genus EUCALANUS Dana, 1853

EUCALANUS ATTENUATUS (Dana)

Calanus attenuatus DANA, Proc. Amer. Acad. Arts and Sci., vol. 2, p. 18, 1849; United States Exploring Expedition, 1838–42 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1080, 1853; pl. 75, fig. 2 a–m, 1855.

Stations 1; 13; 15; 16; 22; 25–27; 30; 31; 33; 41–44; 46; 48; 49; 52; 55; 57; 65; 67; 75; 76; 78; 2396; 2792; 2859; 3712; 3765; 3799; 3800;

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3867; 4009–4011; 4086; 4580; 4583; 4585; 4588; 4590; 4592; 4605; 4607; 4611; 4613; 4615; 4634; 4635; 4638; 4640; 4644; 4646; 4648; 4650; 4663; 4665; 4667; 4671; 4673; 4676; 4706–4708; 4713–4716; 4719; 4723; 4730; 4731; 4734; 4757; 4758; 4760; 4765; 4785; 4793; 4806; 4926; 4952; 5030; 5120; 5125; 5129; 5133; 5134; 5155; 5175; 5180; 5185; 5186; 5190; 5208; 5223; 5224–5229; 5231–5234; 5240; 5246; 5262; 5263; 5287; 5319; 5320; 5338; 5342; 5396; 5399; 5415; 5422; 5424; 5434; 5437; 5451; 5489; 5553; 5595; 5601; 5611; 5633; 5672; H. 2700; H. 2701; Fiji Islands. As this list plainly shows, the above is the most widely distributed species of the genus in the *Albatross* plankton. It appears in all the lists except that of the *Siboga* plankton and is nearly always stated to be abundant.

EUCALANUS BUNGII Giesbrecht

Eucalanus elongatus var. *bungii* GIESBRECHT, Fauna und Flora des Golfes von Neapel, monogr. 19, p. 149, 1892.

Stations 5120; 5130; 5228; 5231; 5386. After a careful study of the varieties of *Eucalanus elongatus* in the northeastern Pacific, Dr. Martin W. Johnson (1938, p. 167) decided that two of them were worthy of being elevated to the rank of species. Since he found the males of both varieties and they differed specifically from each other and from the typical *elongatus* male, his claim seems valid. This is the first of the two varieties and is distinguished by an acute triangular forehead in the female and by the details of the fifth legs in the male. A dozen specimens were examined in sufficient detail to identify them and probably others could be found.

EUCALANUS CRASSUS Giesbrecht

Eucalanus crassus GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 4, sem. 2, p. 333, 1888; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 132, 151, pl. 4, fig. 9; pl. 11, figs. 8, 10, 15, 17, 21, 22, 29, 33, 35, 38; pl. 35, figs. 4, 20, 26–28, 1892.

Stations 26; 27; 65; 78; 3829; 4673; 4765; 4926; 5129; 5134; 5175; 5180; 5185; 5186; 5223; 5225; 5226; 5228; 5229; 5233; 5319; 5422; 5553; 5595; 5611. This species was also found at 5 Monaco, 32 *Siboga*, and 34 *Carnegie* stations, and so it may be deemed to be well distributed.

EUCALANUS ELONGATUS (Dana)

Calanus elongatus DANA, Proc. Amer. Acad. Arts and Sci., vol. 2, p. 18, 1849; United States Exploring Expedition, 1838–1842 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1079, 1853; pl. 75, fig. 1 a-n, 1855.

Stations 1; 15; 16; 25; 27; 31; 41; 43–45; 48; 49; 51; 52; 57; 65; 66; 70; 71; 76–78; 80; 3382; 3412; 3602; 3878; 3901; 4010; 4574; 4580; 4613; 4634; 4635; 4640; 4644; 4648; 4663; 4667; 4671; 4676; 4679;

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4681; 4683; 4685; 4687; 4691; 4700; 4705; 4707; 4709; 4711; 4713; 4715–4719; 4721; 4722; 4745; 4759; 4760; 4765; 4766; 4774; 4783; 4785; 4793; 4806; 4926; 4952; 5102; 5110; 5120; 5129; 5133; 5155; 5175; 5176; 5180; 5185–5187; 5190; 5196; 5223–5225; 5227–5229; 5231; 5233; 5240; 5262; 5263; 5287; 5319; 5320; 5348; 5386; 5422; 5434; 5437; 5553; H. 2700; Nasugbu Bay, southern Luzón, Philippine Islands; Fiji Islands. This species was found at 54 Monaco and 74 *Carnegie* stations but was not present in the *Siboga* or *Challenger* plankton.

EUCALANUS MONACHUS Giesbrecht

Eucalanus monachus GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 4, sem. 2, p. 333, 1888; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 132, 151, pl. 11, fig. 37; pl. 35, figs. 5, 14, 33, 36, 1892.

Stations 15; 16; 59; 65–67; 71; 73; 75–80; 3765; 4594; 4611; 4615; 4644; 4659; 4661; 4673; 4716; 4743; 4758; 4760; 4767; 4800; 4952; 5129; 5185; 5186; 5209; 5225; 5227; 5228; 5231; 5233; 5234; 5262; 5263; 5299; 5301; 5338; 5340; 5348; 5358; 5397; 5404; 5414; 5415; 5436; 5488; 5489; 5507; 5530; 5601; 5647; 5651; Iloilo Straits, Philippine Islands. Present at 22 *Siboga*, 13 Monaco, and 21 *Carnegie* stations and therefore fairly widely distributed.

EUCALANUS MUCRONATUS Giesbrecht

Eucalanus mucronatus GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 4, sem. 2, p. 334, 1888; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 132, 151, pl. 11, figs. 9, 26, 34; pl. 35, figs. 15, 35, 38, 1892.

Stations 31; 49; 66; 71; 3829; 3901; 4598; 4605; 4667; 4713; 4757; 4760; 4763; 4793; 4806; 4926; 5030; 5102; 5120; 5125; 5129; 5178; 5179; 5185; 5186; 5190; 5223; 5225–5227; 5229; 5231; 5233; 5246; 5263; 5287; 5386; 5397; 5422; 5436; 5553; 5578; 5611; H. 1689; H. 2700; H. 2701; Amchitka Island, Alaska; Sabtán Island, Philippine Islands. Almost half the tows in which this species was found were surface tows, the rest were vertical, starting from a depth of 300 fathoms, one from as much as 550 fathoms, and several at less than 250 fathoms. Since Sars found it at 34 Monaco stations and all his specimens came from "more or less considerable depths," it would seem as though this species did not frequent the surface as much as the other species of this genus. It is included also in the *Siboga* and *Carnegie* lists.

EUCALANUS MUTICUS [Sars MS.] Wilson, new species

PLATE 7, FIGURES 63–69

Stations 4561; 4571; 4574; 4580; 4583; 4585; 4590; 4594; 4598; 4605; 4607; 4613; 4634; 4646; 4650; 4652; 4655; 4657; 4659; 4663;

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4664; 4667; 4668; 4671; 4673; 4676; 4700; 4713; 4719; 4721; 4722; 4757; 4785; Fiji Islands. Although the species was found at so many stations, it was not at all abundant, two or three specimens at a station being the usual number.

Female.—Metasome elongate and narrow; head fused with the first segment into a cephalothorax twice as long as the rest of the metasome and the urosome combined. The rest of the thorax narrowed regularly backward, with the posterior corners smoothly rounded without spines. Forehead triangular, the apex sharp but without a spine; rostrum removed considerably from the apex, the filaments very slender and curved like parenthesis marks. Fourth and fifth segments fused on the ventral surface but separated dorsally and elevated considerably above the genital segment. Urosome less than one-eighth as long as the metasome and 4-segmented; genital segment longer than wide, the sides slightly convex and the ventral surface protruding a little. Abdomen 3-segmented, the segments about the same length and much wider than long. Caudal rami at the corners of the anal segment, twice as long as wide and somewhat divergent. The second inner seta on the left ramus is greatly elongated, as in nearly all the other species of this genus.

First antennae reaching four segments beyond the tips of the caudal rami, with a stout seta on the penultimate and antepenultimate segments and all the other setae filiform. The two stout setae are plumose and often highly colored and reach to the tip of the elongated seta on the left caudal ramus. The exopod of the second antenna is 7-segmented, each of the two basal segments with two setae, the next four with one apiece and the end segment with three terminal setae, the two inner ones much elongated. Mandible palp twice the length of the chewing blade and biramose, the outer ramus with two exceptionally long setae. The tooth at each end of the chewing blade is acute, the intervening ones are laminate and truncated. The maxilliped is 8-segmented, the segments with 6 : 3 : 2 : 3 : 4 : 3 : 3 : 2 setae respectively, beginning at the base. The exopod of the first leg has three segments, the two basal ones without outer spines, the end segment with one at the distal corner; the endopod is 2-segmented. The rami of the second, third, and fourth legs are each 3-segmented, the end segment of the exopod with two outer spines and one at the distal corner; the fifth legs are lacking. Total length 5.65 mm. Metasome 4.64 mm. long, 0.92 mm. wide.

Male.—Body similar to that of the female except that the urosome is 5-segmented and there are five pairs of legs instead of four. These fifth legs are uniramose and 4-segmented, the two basal segments nearly twice the width of the two terminal ones, the end segment

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tipped with an acicular spine as long as the last two segments combined. The penultimate segment also has a small spine at its outer distal corner. Total length 5.50 mm.

Types.—U. S. N. M. No. 70727; station 4673; latitude 12°30′30″ S., longitude 77°49′30″ W., off Peru.

Remarks.—This species may be recognized by the pointed forehead, the 4-segmented urosome, the exceptional mandibular palp with its abnormal setae, and the peculiar characters of the exopod of the second antennae. The distance the pointed forehead projects beyond the base of the rostrum and the details of the fifth legs in the male are also aids in identification.

EUCALANUS PILEATUS Giesbrecht

Eucalanus pileatus GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4 vol. 4, sem. 2, p. 334, 1888; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 132, 151, pl. 11, figs. 3, 28, 41; pl. 35, figs. 7, 8, 19, 39–41, 1892.

Stations 4638; 5129; 5232. This is the smallest species of the genus and also one of the least abundant, although it has been reported from the Red Sea and the Atlantic, Pacific, and Indian Oceans. It was present in the *Siboga* plankton but not in any of the other lists.

EUCALANUS SUBCRASSUS Giesbrecht

Eucalanus subcrassus GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 4, sem. 2, p. 334, 1888; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 132, 151, pl. 11, figs. 6, 14, 19, 30, 39; pl. 35, figs. 12, 16, 31, 32, 1892.

Stations 48; 4638; 4640; 4644; 4652; 4673; 4716; 4926; 5102; 5129; 5134; 5180; 5185; 5223–5226; 5230; 5231; 5233; 5262; 5633. Identified by Sars at 5 of these Pacific stations and by Scott at 45 *Siboga* stations but not present in the other planktons.

EUCALANUS SUBTENUIS Giesbrecht

Eucalanus subtenuis GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 4, sem. 2, p. 333, 1888; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 132, 150, pl. 11, figs. 4, 23, 42; pl. 35, figs. 9–11, 18, 29, 30, 1892.

Stations 4611; 4646; 4650; 4652; 4657; 4659; 4663–4665; 4667; 4671; 4673; 4713; 4715; 5120; 5134; 5180; 5185; 5223; 5225; 5230; 5232; 5301. Identified by Sars from 11 of these Pacific *Albatross* stations and at 3 Monaco stations; found at 34 *Siboga* stations and at 6 *Carnegie* stations in the Pacific.

Genus EUCHAETA Philippi, 1843

EUCHAETA ACUTA Giesbrecht

Euchaeta acuta GIESBRECHT, Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 246, 262, pl. 16, figs. 6, 10, 14, 18, 21, 27, 39; pl. 37, figs. 47, 48, 52, 1892.

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Stations 1; 71; 76–78; 3930; 3980; 4427; 4580; 4583; 4585; 4587; 4611; 4644; 4646; 4652; 4659; 4685; 4691; 4716; 4721; 4740; 5030; 5129; 5185; 5186; 5224; 5225; 5227; 5231; 5233; 5246; 5340; 5422; Fiji Islands. Identified by Sars from 9 of these *Albatross* and at 76 Monaco stations and present also at 53 stations in the *Carnegie* plankton, while only 4 specimens were reported in the *Siboga* plankton.

EUCHAETA CONCINNA Dana

PLATE 8, FIGURES 72–73; PLATE 22, FIGURE 326

Euchaeta concinna DANA, Proc. Amer. Acad. Arts and Sci., vol. 2, p. 21, 1849; United States Exploring Expedition, 1838–42 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1088, 1853; pl. 77, figure 4a–c, 1855.

Stations 4684; 4700; 4731. Established by Dana upon specimens of both sexes from the Straits of Banca east of Sumatra and found also at 40 stations in the *Siboga* plankton, but not present in the other lists. The female can be recognized by the structure of the genital segment, which is clearly shown in Sars' figures here reproduced. The male is distinguished by the detailed structure of the last segment of the left fifth leg, which is shown in figure 326.

EUCHAETA HEBES Giesbrecht

Euchaeta hebes GIESBRECHT, Atti Acad. Lincei, Rome, ser. 4, vol. 4, sem. 2, p. 337, 1888; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 246, 263, pl. 15, figs. 29, 30; pl. 16, figs. 3–5, 20, 31, 32, 38, 44; pl. 37, figs. 32, 33, 54, 1892.

Stations 3765; 5262. Identified by Sars from seven Monaco stations with both sexes fully described in the Monaco report. It is present in the *Carnegie* but not in the other plankton lists but has been reported casually in small numbers from nearly all the oceans.

EUCHAETA LONGICORNIS Giesbrecht

PLATE 8, FIGURES 79–83

Euchaeta longicornis GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 4, sem. 2, p. 337, 1888; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 246, 264, pl. 16, figs. 35, 37; pl. 37, figs. 45, 46, 1892.

Stations 4634; 4635; 4638; 4640; 4644; 4646; 4652; 4663; 4664; 4671; 4715; Fiji Islands. A single female was found in the *Siboga* plankton and no specimens in the other planktons, and since all Giesbrecht's original specimens were females the male has remained unknown. Furthermore, no dorsal view of the female has ever been published, and the descriptions given by Giesbrecht and Scott are very meager, especially that of Scott. Accordingly, the figures drawn by Sars, who identified these *Albatross* specimens, are here reproduced, and a full description of both sexes is given.

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Female.—Metasome elliptical, a little more than twice as long as wide, the forehead triangular, coming to a sharp point, the fourth and fifth segments fused and smoothly rounded at the posterior corners, without hairs. Urosome very slender, half as long and a third as wide as the metasome and 4-segmented. Genital segment as long as the entire abdomen and twice as long as wide, with a peculiar process on the right side near the posterior corner that is plainly visible in dorsal view. This process is laminate and extends diagonally backward with a rounded tip and a small spine on the outer margin at the base of the rounded portion. Abdomen 3-segmented, the segments diminishing considerably in length and a little in width backward. Caudal rami as long as the anal segment, longer than wide, each with 4 setae, two terminal and two on the outer margin, all about the same length.

First antennae filose extending to the tips of the caudal rami and sparsely setose. The exopod of the second antenna is a little longer than the endopod; the spines on the exopods of the swimming legs are short and stout, and there is an incision in the segment inside the base of each spine. Total length 3.10 mm. Metasome 2.10 mm.

Male.—Body elongate and slender; metasome corresponding to that of the female. Urosome 5-segmented; the genital segment proportionally much shorter than that of the female and without protuberance. The antennae, mouth parts, and first four pairs of legs are the same as in the female. The fifth legs are surprisingly large for so small a species and reach far beyond the tips of the caudal rami (fig. 83). The second basipod of the right leg is considerably swollen, and the basal half of the endopod is also swollen, while the distal half tapers to a sharp point. The proximal portion of the exopod is of uniform width and just reaches the tip of the endopod. The distal portion is longer than the proximal, very slender, slightly curved, and tapered to an acuminate point. The second basipod of the left leg is much longer than that of the right and swollen a little proximally. The endopod is entirely lacking; the second segment of the exopod has a long terminal stylet swollen at its base and tapered to an acuminate point. Opposite the base of the stylet is an inner process with spines along its margin and at its tip and between the two is an inner unarmed process. Total length 2.65 mm. Metasome 1.80 mm. long.

Allotype male.—U.S.N.M. No. 70732; station 4671, latitude 12°07′ S., longitude 78°28′ W.

Remarks.—The fifth legs of a fully matured male are shown in figure 83, while those of a juvenile male appear in figure 88. The laminate process on the right margin of the female genital segment and the peculiar stylet at the tip of the left fifth leg of the male are disinguishing characters.

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EUCHAETA MARINA (Prestandrea)

Cyclops marinus PRESTANDREA, Effemeridi Sci. e Lett. Sicilia, vol. 6, p. 12, 1833.

Stations 1; 5; 6; 14–16; 18; 19; 24; 27; 30–32; 42; 44–46; 48; 52–55; 57, 59, 60, 65, 70, 71, 75–78; 80; 173; 236; 2236; 2396; 3412; 3712; 3765; 3789; 3791; 3799; 3829; 3834; 3867; 3878; 3901; 3911; 3912; 3921; 3927; 3929; 3930; 3932; 3980; 4009–4011; 4037; 4086; 4190; 4427; 4580; 4583; 4588; 4590; 4592; 4594; 4605; 4607; 4611; 4613; 4615; 4619; 4635; 4638; 4640; 4644; 4646; 4657; 4659; 4661; 4667; 4671; 4673; 4681; 4684; 4687; 4700; 4705–4709; 4713–4716; 4721; 4722; 4724; 4730; 4731; 4734; 4738; 4915; 4926; 4952; 5102; 5105; 5120; 5129; 5133; 5134; 5155; 5175; 5185; 5186; 5190; 5196; 5223–5227; 5229, 5231; 5233; 5240; 5246; 5258; 5262; 5263; 5308; 5319; 5320; 5338; 5340; 5342; 5348; 5358; 5396; 5397; 5422; 5434; 5437; 5451; 5489; 5578; 5611; 5627; Fiji Islands. As shown above this is the most widely distributed species in the *Albatross* plankton and it is present in all the plankton lists. It frequents tropical and temperate regions of all oceans, often in abundance.

EUCHAETA MEDIA Giesbrecht

PLATE 22, FIGURES 323–325

Euchaeta media GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 4, sem. 2, p. 337, 1888; Fauna und Flora des Golfes von Neapel, monogr, 19, pp. 246, 263, pl. 16, figs. 13, 36; pl. 37, figs. 39, 40, 1892.

Stations 3867; 4038; 5185; 5227. Established by Giesbrecht upon female specimens from the tropical Pacific, this species appeared in the *Siboga* plankton as a single female from the East Indies but was absent from the other lists. However, 40 females were recorded by Esterly (1905, p. 160) off the coast of California, about 2,700 were obtained by Farran (1929, p. 238) in the Terra Nova plankton, and Sewell (1929, p. 149) reported a few from the Bay of Bengal. But in spite of this abundance the male has hitherto remained unknown and is here described for the first time. Incidentally the statement by Scott that the distribution of this species is "very limited" must be given a strictly geographical and not at all a numerical interpretation.

Female.—Metasome elliptical, three times as long as wide, much narrowed anteriorly, not as much posteriorly. Forehead with a notch above the rostrum, which extends almost horizontally forward, posterior corners of the last thoracic segment slightly but distinctly angular. Urosome two-fifths as wide as and three-fifths as long as the metasome and 4-segmented. Genital segment asymmetrical, swollen anteriorly on the left side and posteriorly on the right side with a large ventral protuberance having an irregular outline. The filiform

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appendicular setae on the caudal rami are longer than the plumose setae. Total length 3 to 3.75 mm. Metasome 2.28 mm. long.

Male.—Metasome like that of the female but narrowed more anteriorly and with the posterior corners more angular, extending back beyond the center of the genital segment. The rostrum extends almost horizontally forward with a well-defined notch above its base. Urosome two-fifths as long and only a fourth as wide as the metasome, and 5-segmented. The first four segments are about the same length and width, the fifth or anal segment is as wide but much shorter. The caudal rami are widely separated, divergent, and wider than long, each with one appendicular and five plumose setae.

The first antennae do not quite reach the posterior corners of the metasome; they are rather slender, and neither of them is geniculate. The second antennae, mouth parts, and first four pairs of legs are like those of the female. The fifth legs are shown in figure 324. The two basipod segments of the right leg are considerably swollen; the endopod is shaped like a ladle and is about as long as the proximal segment of the exopod. The bowl of the ladle is concave toward the exopod and fits around the inner side of the latter. The proximal segment of the exopod is swollen through the center and tapers toward each end. The terminal segment is an elongated slender spine enlarged at its base and acuminate at the tip. The two basipod segments of the left leg are about twice as long as those of the right leg; there is no endopod, and the exopod is 3-segmented. The proximal segment is narrow at its base and enlarges distally; the second segment is as wide as long, with a spine at the inner distal corner and at the center of the distal margin a slender process with a flattened spatulate tip. The third segment is half as wide as the second, hollowed on its inner surface, and enlarged at the distal end into a knob with two inner spines and a much longer terminal stylet. Total length 3.27 mm. Metasome 2.50 mm. long.

Allotype male.—U.S.N.M. No. 74114; station 5185, latitude 10°05′45″ N., longitude 122°18′30″ E., between Panay and Negros, Philippine Islands.

Remarks.—The asymmetry of the left side of the genital segment and of the ventral protuberance in the female and the ladle-shaped endopod of the right leg in the male are the chief characteristics of this species.

EUCHAETA PUBERA Sars

Plate 22, Figures 327–329; Plate 23, Figures 330, 331

Euchaeta pubera Sars, Bull. Inst. Océanogr. Monaco, No. 101, p. 13, 1907; Rés. camp. sci. Albert de Monaco, No. 69, p. 109, pl. 30, figs. 16–18, 1925.

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Stations 3867; 3921; 4683; 4685; 5185; 5231. Identified by Sars in the Monaco plankton; based on female specimens only which he fully described and figured. He claimed that Scott's *Euchaeta wolfendeni* in the *Siboga* plankton was a synonym of *pubera* and of necessity adopted the *wolfendeni* male as the male of *pubera*. It will be shown, however, under *wolfendeni* (p. 217) that the two species are not the same, and that leaves *pubera* with females alone. Fortunately, the *Albatross* specimens included males and one of these is here described and figured for the first time.

Female.—Metasome elliptical, 2⅔ times as long as wide, narrowed considerably in front but only a little behind, with broadly rounded posterior corners. Urosome nearly half as long and a third as wide as the metasome and 4-segmented. Genital segment as long as the entire abdomen, with a large ventral protuberance, having on the right side of the genital area a short lamella terminating in a curved point. The first antennae are slender and reach slightly beyond the posterior corners of the metasome. Total length 4 mm. Metasome 2.92 mm. long, 1.15 mm. wide.

Male.—Metasome with the same proportions as in the female but more pointed in front, with the posterior corners evenly rounded in side view but in dorsal view narrowed to thin edges turned outward. Urosome more than half as long and less than a fourth as wide as the metasome, 5-segmented, the segments narrowing slightly backward. The genital segment is shorter than either of the first two abdominal segments, which are of equal length and one-half longer than the penultimate segment. The anal segment is so short as to be scarcely visible and the caudal rami are also very short and subglobular.

The first antennae are longer than in the female and reach the abdomen, and neither of them is geniculate. The second antennae, mouth parts, and first four pairs of legs are like those of the female. The fifth legs are large and extend beyond the tips of the caudal rami in spite of the length of the urosome. The basipod of the right leg is considerably swollen; the exopod is 2-segmented, the distal segment tapered into a curved spine. The endopod is also 2-segmented but no longer than the basal segment of the exopod. In the left leg the second basipod is elongate but not swollen and carries on its inner margin near the tip the rudiment of an endopod. The inner projection of the second segment of the exopod is enlarged and notched at its tip, and the outer margin is fringed with spinules. The third segment has a rounded protuberance tipped with a spine on its inner margin opposite the tip of the projection of the second segment. Between the base of the third segment and this projection are the

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processes seen in figure 331. The tip of the third segment is tapered into an exceptionally long spine. Total length 3.75 mm. Metasome 2.50 mm. long, 1 mm. wide.

Allotype male.—U.S.N.M. No. 74115; station 5185, latitude 10°05′45″ N., longitude 122°18′30″ E., between Panay and Negros, Philippine Islands.

Remarks.—The lamella with the curved point on the ventral protuberance of the female is easily visible in side view and, together with the subglobular caudal rami of the male, makes identification easy.

EUCHAETA SPINOSA Giesbrecht

PLATE 18, FIGURES 243–244

Euchaeta spinosa GIESBRECHT, Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 246, 263, pl. 16, figs. 12, 23, 34, 47; pl. 37, figs. 31, 34, 35, 50, 1892.

Stations 3; 19; 22; 31; 41; 42; 48; 52; 2861; 3694; 3712; 3765; 3800; 3878; 3932; 4009; 4010; 4190; 4583; 4588; 4646; 4694; 4700; 4707; 4719; 4722; 4757; 4760; 4793; 4926; 4952; 5120; 5129; 5185; 5186; 5190; 5196; 5224; 5226–5229; 5231; 5233; 5240; 5246; 5263; 5320; 5396; 5397; 5422; 5451; 5578. Identified by Sars from 13 of these *Albatross* and from 30 Monaco stations but not found in the *Siboga* plankton and only twice in the *Carnegie* plankton.

EUCHAETA WOLFENDENI A. Scott

PLATE 8, FIGURES 74–78

Euchaeta wolfendeni A. SCOTT, Copepoda of the *Siboga* Expedition, monogr. 29a, pt. 1, p. 68, pl. 17, figs. 1–12, 1909.

Stations 4592; 5120. Identified by Sars from the first of these stations and labeled by him "*E. wolfendeni* A. Scott." Figures 74–76 are reproduced from Sars' pencil drawings and show conclusively that *wolfendeni* cannot be a synonym of *pubera* as claimed by Sars in his Monaco report. He himself drew these figures and those shown for the *pubera* female (figs. 328, 329), and they are certainly not of the same species. The *pubera* urosome lacks the scalloped border on the right margin of the genital segment, while the *wolfendeni* urosome lacks the lamina with a hooked point on the ventral protuberance, and the latter is little more than half as large as the former. But these figures of Sars do agree with those given by Scott in the *Siboga* report for his new species *wolfendeni*. We are forced to conclude, therefore, that we are dealing with two valid species and that neither of them is a synonym of the other. [This was also concluded by Sewell (1929, p. 154), who found it well distributed in Indian waters.—W. L. S.]

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Genus EUCHIRELLA Giesbrecht, 1888

EUCHIRELLA BELLA Giesbrecht

PLATE 8, FIGURE 84; PLATE 9, FIGURE 92–94, PLATE 19, FIGURES 247–248, 261–265

Euchirella bella GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 4, sem. 2, p. 336, 1888; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 233, 244, pl. 15, fig. 26, 1892.

Euchirella amoena GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 4, sem. 2, p. 336, 1888.

Euchirella amöna GIESBRECHT, Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 233, 244, pl. 15, fig. 20, 1892.—ROSE, Rés. camp. sci. Albert de Monaco, No. 78, pp. 21–23, pl. 1, fig. 3, 1929.

Stations 15; 4638; 4665; 4667; 4700; 4710; 4715; 4716; 5102. In 1888 Giesbrecht established two new species of this genus—*bella*, based upon a single female from the eastern Pacific south of the Equator, and *amoena*, based upon a single male from the eastern Pacific north of the Equator. In his Naples monograph he gave a very brief (five lines) description of *bella* and a still briefer (two lines) one of *amoena*, each with a single figure. Since the original discovery, *amoena* has been reported three times. It was merely named by Scott in the *Siboga* plankton and by Esterly from off southern California, but was given a detailed description by Rose in the Monaco plankton with 15 figures. Except for Sewell's record from the Indian Ocean (1929, p. 109) the original specimen of *bella* has remained the only one recorded up to the present time. But the discovery of 5 *amoena* males and 20 *bella* females in the surface tow at station 4700 suggested that they were male and female of the same species, as can be seen from the complete description of an *Albatross* female given below for comparison with Rose's excellent description and figures of the male. There is no doubt that they are the male and female of the same species. The name *bella* takes precedence over *amoena*.

Female.—Metasome elliptical, twice as long as wide; forehead slightly pointed; rostrum short and conical; posterior corners smoothly rounded. Urosome one-fourth as long and wide as the metasome; genital segment asymmetrical, protruding to the left and making the segment wider than long. The three abdominal segments are about the same length and width and combined are as long as the genital segment but narrower. Caudal rami as wide as long, widely separated at the corners of the anal segment and divergent.

The first antennae are slender and reach the tips of the caudal rami; they have long filiform setae on several of the segments but lack the aesthetasks so numerous in the male. The exopod of the second antenna is not quite three times as long as the endopod; the terminal segment of the latter has six and five setae as stated by Giesbrecht.

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The second basipod segment carries at its base on the inside a small process tipped with two stout setae. The chewing blade of the mandible has a short truncate tooth at the outer corner and an acuminate spine at the inner corner and between them two irregular rows of teeth, some acute, and some truncate. The mandibular palp is biramose, the rami 2-segmented, the proximal segments unarmed, the distal exopod segment with six setae, the endopod segment with eight setae. The maxilliped is 7-segmented, the first segment with four setae on the ventral surface, the second segment with three setae at the center of the posterior margin, the five distal segments each with two long, curved setae.

The first legs are small, the exopod 2-segmented, the endopod 1-segmented; the two basipod segments are rectangular, and each has a tuft of hairs on its inner margin. The basal exopod segment has two spines on its outer margin and a seta at its inner distal corner; the end segment has a spine at the distal corner and four inner setae. The endopod has five setae and does not reach the distal end of the first exopod segment. The first basipod of the second leg has a bunch of hairs and a plumose seta on its inner margin; the second basipod is unarmed. The endopod is 1-segmented with six setae, one outer, two terminal, and three inner, and reaches beyond the center of the second exopod segment. The exopod is 3-segmented; the basal segment has an outer spine and an inner seta, the second segment has two outer spines and an inner seta, the third segment has two outer spines, two at the distal corner, one terminal and four inner setae. The third and fourth legs have 3-segmented rami; the two proximal exopod segments each carry two spines at the outer distal corner and an inner seta; the end segments each have two outer spines, two at the distal corner, a stout serrated terminal spine and four inner setae. The endopods just reach the distal end of the second exopod segment; the first segment has two outer spines and an inner seta; the second segment has one outer spine and a fringe of hairs and an inner seta; the third segment has five setae. It is the second basipod of the fourth legs that carries the distinctive armature in the females of this genus since they lack fifth legs. In the present species most of the females carry on the inner margin of this basipod segment a large plumose seta and a row of four spines fused at their bases (fig. 94), but rarely three spines and a seta (fig. 248). The above description is based on a female specimen from station 5102.

EUCHIRELLA BITUMIDA With

PLATE 23, FIGURES 332–335

Euchirella bitumida WITH, Danish Ingolf-Expedition, vol. 3, pt. 4, p. 131, fig. 34, pl. 5, figs. 9 a-g; pl. 8, figs. 4 a-e, 1915.

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Stations 3712; 4680; 4757; 4758; 5120; 5185; 5227; 5232; 5233; 5246; 5263; 5287; 5296. Established by With upon female and young male specimens from the North Atlantic and reported by Sars from 28 Monaco stations all in the Atlantic and all the specimens females. It is not included in any of the other plankton lists. The *Albatross* secured the first adult males to be obtained. This is also the first record from the Pacific.

Female.—Metasome elongate elliptical, two and a half times as long as wide, and only slightly narrowed at either end. Head with a prominent crest in the form of a helmet at the top of the forehead in side view; posterior corners of the last segment rounded. Urosome less than a fourth as long as the metasome; genital segment asymmetrical, swollen on the right side. First antennae reaching the center of the genital segment. Proximal segment of the fourth basipod with a plumose seta and a single spine on the inner margin near the distal end. Total length 6.10 to 6.70 mm.

Male.—Metasome considerably narrower than in the female; head with a prominent frontal crest but not galeate as in the female; fifth segment with rounded posterior corners. Urosome one-fifth as wide and two-fifths as long as the metasome and 5-segmented, the anal segment very short. Caudal rami longer than wide, the setae nearly as long as the entire abdomen.

First antennae reaching the middle of the genital segment, the basal segments stout, the remainder quite slender, neither antenna geniculate. The exopod of the second antenna about one-third longer than the endopod; the mouth parts and first four pairs of legs like those of the female. In the fourth legs the first segment of the basipod has a plumose seta on the inner margin; the second basipod is unarmed. The first segment of the exopod has a tripartite spine at its outer distal corner and the first segment of the endopod has two short spines on the outer margin. The fifth legs are shown in figure 334. The two basipods of the right leg are considerably thickened and elongated, and the second one is invaginate at the distal end for the reception of the exopod. The latter is 2-segmented; the first segment is widened at its base where it is inserted in the basipod and has two knobs on its inner margin. The end segment is curved a little and its inner surface is cut transversely into a series of flattened ridges (fig. 335). The endopod is more strongly curved and also has two knobs on its inner surface, a larger one near the base and a smaller one near the tip. The left leg is uniramose, 4-segmented, and tipped with a small curved spine. Total length 5.9 to 6.10 mm. Metasome 4.25 mm. long.

Allotype male.—U.S.N.M. No. 74117; station 5227, latitude 12°53′45″ N., longitude 121°52′30″ E., east of Mindoro, Philippine Islands.

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Remarks.—This new male bears most resemblance to that of *messinensis* but is a half larger and has a much more pronounced frontal crest. It also closely resembles Esterly's (1911, p. 321) species *propria*, but the latter has no frontal crest and its metasome is proportionally much longer.

EUCHIRELLA BREVIS Sars

Euchirella brevis SARS, Bull. Mus. Océanogr. Monaco, No. 26, p. 12, 1905a; Rés. camp. sci. Albert de Monaco, No. 69, p. 71, pl. 21, figs. 1–7, 1925.

Stations 5; 15; 16; 19; 27; 39; 76; 3799; 4685; 4699; 4700; 4707; 4721; 4722; 4732; 4734; 4750; 4757; 4793; 4926; 5129; 5185; 5224; 5227; 5229; 5231; 5233; 5246; 5422. Established by Sars on female specimens only; no male has yet been obtained. Reported in the *Carnegie* plankton list.

EUCHIRELLA CURTICAUDA Giesbrecht

PLATE 23, FIGURE 336

Euchirella curticauda GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 4, sem. 2, p. 336, 1888; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 233, 244, pl. 15, figs. 3, 13, 25; pl. 36, figs. 19, 20, 1892.

Stations 2; 44; 3712; 3799; 3800; 3829; 4683; 4685; 4687; 4693; 4721; 4730; 4742; 4926; 5120; 5129; 5185; 5227; 5231; 5233; 5246; 5263; 5287; 5553. This species was found in the *Siboga*, Monaco and *Carnegie* lists, but more abundantly in the Monaco plankton. It was founded upon females only, but Sars included both sexes in his Monaco report. Some of the *Albatross* males show a variation in the structure of the fifth legs and this has been represented in figure 336. The right endopod is relatively shorter and more pointed at its tip, while the teeth at the tip of the exopod are blunt instead of acuminate and longer than in the Sars' figure. The distal segment of the left leg is tipped with a fingerlike process instead of a plumose seta. In all other respects these males correspond with Sars' figures. The species can be distinguished by the fact that the crest on the head is more or less triangular in both sexes and the female has a row of 9 to 13 spines across the basipod of the fourth legs.

EUCHIRELLA GALEATA Giesbrecht

PLATE 8, FIGURES 85–88; PLATE 9, FIGURES 89–91; PLATE 23, FIGURE 337

Euchirella galeata GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 4, sem. 2, p. 336, 1888; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 233, 244, pl. 15, fig. 18; pl. 36, fig. 22, 26, 1892.

Stations 2; 27; 4611; 4637; 4638; 4650; 4652; 4661; 4663–4665; 4667; 4668; 4671; 4676; 4679; 4700; 4705; 4707; 4715; 4717; 4719; 4721; 4742; 4757; 4758; 5120; 5185; 5227; 5231; 5233; 5246; 5263; 5320. The female of this species was very briefly described and inadequately

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figured by Giesbrecht in his Naples monograph and the male recorded as unknown. Since that time the description and figures of the female have not been improved and only two statements with regard to the male have appeared. Esterly (1905, p. 156) said "head as in the female," and that constituted his entire description. A. Scott recorded two young males in the *Siboga* plankton but gave no word of description. The pencil drawings of this species made by Sars included both sexes and were so good that they are here reproduced and a complete description is given.

Female.—Metasome stout and more or less cylindrical; head narrowed anteriorly with a median crest, which is raised into an anterodorsal cap or helmet, semicircular in outline when seen laterally. This is similar to the crest on the head of *bitumida* and *curticauda* but is relatively smaller. Head fused with the first segment, the resultant cephalothorax just exceeding the length of the rest of the metasome. The fifth segment is rounded or somewhat squarely truncated at the posterior corners and reentrant at the center dorsally. Urosome about one-fifth as long as the metasome and 4-segmented; the genital segment is wider than long, with an asymmetrical process on the left side. Each of the three abdominal segments is also wider than long and they increase in length backward. The caudal rami are attached to the posterior corners of the anal segment, far apart and divergent, each with four setae, the outer one on the outer margin near the base of the ramus. There are two ovisacs, each cylindrical and two-thirds as long as the entire body, the eggs moderately large and irregularly arranged, 30 to 35 in each ovisac.

The first antennae are slender and reach beyond the caudal rami; the exopod of the second antenna is nearly three times as long as the endopod and armed with very long setae (fig. 86). The chewing blade of the mandible has a long acuminate tooth at the inner corner, with four larger curved teeth and two smaller straight ones scattered along its edge. The exopod of the first leg is 2-segmented, the endopod 1-segmented; the exopod of the second leg is 3-segmented, the endopod 1-segmented; both rami of the third and fourth legs are 3-segmented. The first basipod of the fourth leg has a plumose seta on its inner margin and a single spine on its posterior surface. Total length 5.86 mm. Metasome 4.90 mm. long 1.75 mm. wide.

Male.—Metasome with the same general form as that of the female but a little smaller; head with the crest or helmet so reduced as to be easily overlooked; posterior corners of fifth segment evenly rounded. Urosome 5-segmented with the genital segment perfectly symmetrical and the abdominal segments longer than wide and diminishing in length backward. Caudal rami similar to those of the female but with longer setae.

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The antennae, mouth parts, and first four pairs of legs are like those of the female, while the fifth legs resemble at first sight those of the *messinensis* male. Closer examination, however, reveals that the left leg is fully three-fourths as long as the right. It is 3-segmented and the terminal segment is armed with three small protuberances on its inner margin; the left endopod has entirely disappeared (cf. fig. 88). In the right leg the endopod is considerably inflated, the exopod is 2-segmented, and the endopod 1-segmented and considerably shorter. The proximal segment of the exopod has four processes on its inner margin while the distal segment is fringed on its inner margin with short hairs and is bluntly pointed, with two knobs on the outer margin near the tip. The endopod reaches beyond the tip of the basal exopod segment and is curved, with two acute processes on its inner margin. Total length 5.33 mm. Metasome 4.38 mm. long.

Allotype male.—U.S.N.M. No. 70733; station 4664, latitude 11°30′ S., longitude 87°19′ W., off Peru.

Remarks.—About a dozen males only 4 mm. long were taken with the others. The fifth legs of one of them are shown in figure 88. This figure indicates that even if the left endopod has entirely disappeared in the adult male it was certainly present during development. On page 65 of his Monaco report Sars calls attention in giving the characteristics of the genus *Euchirella* to the very remarkable presence of paired egg strings in three species. He showed two of the species in *messinensis* (pl. 19) and *brevis* (pl. 21), and as he had already examined the *Albatross* plankton this must be the third species to which he referred.

EUCHIRELLA GRANDICORNIS [Sars MS.] Wilson, new species

PLATE 9, FIGURES 98–100; PLATE 10, FIGURES 101–106

Station 4681. A male and a female from this station were identified as a new species by Sars and given the above name.

Female.—Metasome subcylindrical, flattened a little on the ventral surface, three times as long as wide and narrowed at both ends. Head fused with the first segment ventrally but partially separated dorsally with a well-defined frontal crest. Fourth and fifth segments fused with the posterior corners projecting backward to the center of the genital segment. Urosome 4-segmented, less than a fourth as long as the metasome and about the same width throughout. Genital segment as wide as long, perfectly symmetrical, with straight parallel sides; abdomen 3-segmented, the segments nearly the same length, which is half the width. Caudal rami at the corners of the anal segment and divergent, each one-half longer than wide, with five short setae and a much longer inner seta.

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First antennae 24-segmented, considerably thickened at the base and extending four segments beyond the tips of the caudal rami. The proximal half is quite regularly and densely setose, but on the distal half the setae are scattered irregularly. The endopod of the second antenna is five-sevenths as long as the exopod, and the latter is armed with very long setae densely plumose at their tips. The chewing blade of the mandible has very blunt teeth; the exopod of the palp is 4-segmented, with very long setae, the endopod 2-segmented with much shorter setae (fig. 99). The second maxilla has five digitiform lobes each with two setae, both lobes and setae very long (fig. 104). The maxilliped is 7-segmented, the proximal segment with three setae at the center of the outer margin and a curved spine at the outer distal corner. The second segment has three setae on the inner margin, and the five short terminal segments have a dense armature of very long setae. The exopods of all four pairs of legs are 3-segmented, the endopods have 1, 2, 3, and 3 segments, respectively. The basipod of the fourth leg has a row of nine very long acicular spines. The terminal spines on the second, third, and fourth exopods are very long and slender, pectinate on the outer and plumose on the inner side. Total length 7 mm. Metasome 5.55 mm. long; 1.90 mm. wide.

Male.—Metasome similar to that of the female but narrowed more anteriorly and with a more pronounced frontal crest. The head and first segment are completely fused, with no dorsal groove of separation; the posterior corners of the metasome are broadly rounded, and the posterior margin is very reentrant. The urosome is 5-segmented, the second segment the longest and the anal segment the shortest and all about the same width.

The first antennae are shorter than in the female and reach only to the abdomen, and neither of them is geniculate. The second antennae, mouth parts, and first four pairs of legs show no sexual differences. The two fifth legs are about the same length and each is biramose; the two basipods of the left leg are much the longer, while those of the right leg are more swollen. The left exopod is 2-segmented, the end segment a curved claw, the endopod is 1-segmented and rodlike and only three-fourths as long as the basal exopod segment. The exopod of the right leg is 3-segmented, the basal segment with three angular projections on its inner margin; the right endopod is 1-segmented and curled at its tip. Total length 7 mm. Metasome 5.45 mm. long, 2 mm. wide.

Types.—U.S.N.M. No. 67131; station 4681, latitude 18°47′ S., longitude 89°26′ W., Peru to Easter Island.

Remarks.—The distinguishing characters of this species are the low frontal crest, the length of the first antennae in the female, and the

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structure of the fifth legs in the male. The exceptionally long setae on the terminal segments of the maxillipeds will also aid in identification.

EUCHIRELLA INTERMEDIA With

Euchirella intermedia WITH, Danish Ingolf-Expedition, vol. 3, pt. 4, p. 124, fig. 32 a-f; pl. 4, fig. 4 a-c; pl. 8, fig. 3, 1915.

Stations 3799; 3829: 3878; 4721; 4757; 4926; 5120; 5180; 5185; 5190; 5196; 5224; 5227; 5230; 5233; 5246; 5263; 5287; 5319; 5633. Identified by Sars from 35 Monaco stations and listed at two stations in the *Carnegie* plankton but not found in the other lists. This species was abundant at station 5319, but only one or two specimens were captured at any of the other stations.

EUCHIRELLA MAXIMA Wolfenden

PLATE 23, FIGURES 338–339

Euchirella maxima WOLFENDEN, Plankton studies, pt. 1, Copepoda, p. 18, pl. 6, figs. 9–11, 1905b.

Station 5233. A single male and four females of this species were found at this station. It appears in the *Siboga* and Monaco planktons but not in the others, and some of the *Siboga* specimens came from the Banda Sea not far from this Philippine station. The length of the Monaco male was not given, and the *Siboga* specimens were females, but With (1915, p. 127) recorded a length of 6.70 mm. for his Danish *Ingolf* male. This *Albatross* male was considerably larger and measured 7.60 mm., thus approaching the 8 mm. females mentioned by With.

EUCHIRELLA MESSINENSIS (Claus)

Undina messinensis CLAUS, Die freilebenden Copepoden, p. 187, pl. 31, figs. 8–18, 1863.

Stations 27; 3799; 3800; 4638; 4652; 4679; 4695; 4700; 4732; 4750; 4926; 5120; 5185; 5224; 5227; 5263; 5319; 5320; 5437. Established by Claus upon specimens from Messina and placed in Dana's genus *Undina;* transferred to the present genus by Giesbrecht (1892, p. 232). Identified by Sars from 7 of these *Albatross* stations and from 75 Monaco stations; found at 7 stations in the *Siboga* plankton in vertical tows from considerable depths and at 3 stations in the *Carnegie* plankton.

EUCHIRELLA PULCHRA (Lubbock)

Undina pulchra LUBBOCK, Trans. Ent. Soc. London, new ser., vol 4, p. 26, pl. 4, figs. 5–8; pl. 7, fig. 6, 1856.

Stations 4664; 4673; 4681; 4699; 4700; 4707; 4721; 4722; 4732; 4734; 4740; 4750; 5120; 5185; 5190; 5231. Identified by Sars from

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the first 12 of these *Albatross* stations and from 3 Monaco stations; present in all the plankton lists except the Wilkes, but nowhere reported as abundant.

EUCHIRELLA ROSTRATA Claus)

Undina rostrata CLAUS, Die Copepoden-Fauna von Nizza, p. 11, pl. 1, fig. 2, 1866.

Stations 16; 27; 2195; 2219; 4705; 5287; 5437. Identified by Sars from 3 of these *Albatross* stations and from the 23 Monaco stations; found at five stations in the *Carnegie* plankton and listed in the *Challenger* plankton under the name of *Euchaeta hessei*.

EUCHIRELLA VENUSTA Giesbrecht

PLATE 9, FIGURES 95–97′

Euchirella venusta GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 4, sem. 2, p. 336, 1888; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 233, 244, pl. 15, fig. 19; pl. 36, fig. 21, 1892.

Stations 15; 26; 4587; 4594; 4598; 4605; 4638; 4655; 4657–4659; 4661; 4663; 4665; 4671; 4676; 4679; 4689; 4693; 4721; 4722; 4734; 4736. Identified by Sars from 20 of these *Albatross* stations and from 35 Monaco stations, the latter in his preliminary report (1905a, p. 4). In his final report (1925, p. 68), however, he transferred the Monaco specimens to With's species *intermedia*. In his examination of the *Albatross* plankton Sars drew the figures here reproduced and labeled them *venusta*, recognizing that they were different from *intermedia*. They do not correspond with the figures of *intermedia* presented in his Monaco report but do agree fully with Giesbrecht's figures of *venusta* in the Naples report. This is especially true of the basipod of the fourth leg, as can be seen by comparing figure 97′ here shown with plate 15, figure 19, of the Naples report. These *Albatross* specimens show the same stout bipartite spine and scattered spinules. Incidentally, these figures of Sars are the first full-length "portraits" of this copepod. The genital segment of the female has a projection with a semicircular sinus at the left posterior corner as an aid to identification.

Genus FARRANIA Sars, 1920

FARRANIA FRIGIDUS (Wolfenden)

PLATE 21, FIGURE 298

Drepanopsis frigidus WOLFENDEN, Deutsche Südpolar-Exped., 1901–1903, vol. 12, Zool., vol. 4, fasc. 4, p. 245, fig. 29 a-b, 1911.

Farrania oblonga SARS, Bull. Inst. Océanogr. Monaco, No. 377, p. 4, 1920; Rés. camp. sci. Albert de Monaco, No. 69, p. 36, pl. 13, figs. 1–14, 1925.

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Station 5185. [A single female from this Philippine station had been identified by Dr. Wilson as *Drepanopsis frigidus*, a species established by Wolfenden upon specimens captured in the Antarctic Ocean and the Tropical Atlantic. Though not appearing in any of the plankton lists, it was reported from the Antarctic by Farran in the *Terra Nova* Expedition. In his manuscript discussion of this species Dr. Wilson remarked that Sars, in his Monaco report, had described and figured a unique female copepod from the Bay of Biscay under the name *Farrania oblonga*, new genus and species, which was a little larger than the dimensions given by Wolfenden but otherwise corresponded in every essential characteristic and that hence the two are probably synonymous. Neither Wolfenden nor Wilson was aware that *Drepanopsis* had been preoccupied by Warren (1896, p. 144), who gave this name to a genus of Lepidoptera in 1896. Dr. Wilson figured the fifth legs of the *Albatross* specimen, remarking that they "are identical with those shown by Wolfenden and Sars. The species is evidently a rare one and the male still remains unknown. The present specimen extends the distribution of the species into the Pacific Ocean."—W. L. S. The fact that *Farrania oblonga* and *Drepanopsis frigidus* were identical species had already been noticed by Sewell (1929, p. 96). Sewell was also unaware that the name *Drepanopsis* had been preoccupied.—M. S. W.]

Genus FARRANULA (Blake MS.) Wilson, 1932

Farran (1911, p. 283) created a new genus *Corycella* for the reception of several minute species of *Corycaeus*. But the name *Corycella* had been used for a genus of Protozoa by Leger in 1893. Dr. C. H. Blake substituted for it the name *Farranula* in some manuscript notes on the copepods and suggested its adoption. The new name was published in 1932 in U. S. Nat. Mus. Bull. 158, p. 594 (footnote) and is here adopted for the genus.

FARRANULA CARINATA (Giesbrecht)

Corycaeus carinatus GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 7, sem. 1, p. 481, 1891; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 661, 675, pl. 51, figs. 20, 26, 1892.

Stations 14; 39; 41; 42–44; 53; 55; 57–60; 62; 63; 64–67; 70; 71; 73; 79; 80; 82; 3797; 3829; 3834; 3901; 3932; 4009; 4037; 4190; 4952; 5120; 5133; 5175; 5208; 5209; 5233; 5234; 5246; 5262; 5296; 5301; 5320; 5338; 5340; 5348; 5382; 5386; 5387; 5399; 5434; 5437; 5651; 5653; Iloilo Straits, Philippine Islands. Found also at 1 Monaco, 1 *Siboga*, and 120 *Carnegie* stations, the last all at the surface or close to it.

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FARRANULA CONCINNA (Dana)

Corycaeus concinnus DANA, Proc. Amer. Acad. Arts and Sci., vol. 2, p. 39, 1849; United States Exploring Expedition, 1838–42 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1225, 1853; pl. 86, fig. 7 a-b, 1855.

Stations 3901; 4009; 4037; 5102; 5134; 5186; 5223; 5240; 5319; 5348; 5386; 5388; 5646; Niuafu Island. Originally established by Dana upon specimens obtained near the Taumotu Archipelago and transferred by Farran (1911, p. 283) to his new genus *Corycella*. Found in the *Siboga* and *Carnegie* planktons.

FARRANULA CURTA (Farran)

Corycella curta FARRAN, Proc. Zool. Soc. London, 1911, p. 286, pl. 10, figs. 7–11; pl. 11, figs. 1–6.

Stations 5301; 5320. Established by Farran upon specimens from Christmas Island in the Indian Ocean and placed in his genus *Corycella*. Found only in the *Carnegie* plankton.

FARRANULA GIBBULA (Giesbrecht)

Corycaeus gibbulus GIESBRECHT, Atti Accad. Lincei Rome, ser. 4, vol. 7, sem. 1, p. 481, 1891; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 661, 675, pl. 51, figs. 22, 23, 1892.

Stations 14; 15; 24; 30; 43–47; 49; 51–55; 57–66; 70; 71; 73; 80; 3799; 3829; 3867; 3901; 4009; 4037; 4952; 5133; 5175; 5176; 5185; 5186; 5196; 5223; 5226; 5228; 5246; 5262; 5263; 5299; 5301; 5320; 5338; 5340; 5348; 5349; 5382; 5386; 5387; 5399; 5415; 5422; 5430; 5437; 5507; 5530; 5646; 5647; 5651; Iloilo Straits, Philippine Islands; Sabtán Island, Philippine Islands; Fiji Islands; Niuafu Island. This species was found in the *Siboga* and *Carnegie* planktons but not in the others and was occasionally quite abundant.

FARRANULA GRACILIS (Dana)

Corycaeus gracilis DANA, United States Exploring Expedition, 1838–42 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1207, 1853; pl. 85, fig. 1 a–d, 1855.

Stations 14; 30; 57–60; 62–63; 70; 71; 75; 80; 2806; 3789; 4756; 5208; 5301; Fiji Islands. This is another of Dana's new *Corycaeus* species that Farran (1929, p. 296) afterward transferred to his new genus *Corycella*. It was found in the Monaco and *Carnegie* planktons but not in any of the others and is usually found in limited numbers.

FARRANULA ROSTRATA (Claus)

Corycaeus rostratus CLAUS, Die freilebenden Copepoden, p. 157, pl. 28, fig. 5, 1863.

Stations 34; 39; 41; 43; 46–68; 70; 71; 73; 75; 76; 79; 80; 82; 3705; 3765; 3789; 3797; 3799; 3800; 3829; 3867; 3878; 3912; 3927; 3981;

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4009; 4010; 4011; 4037; 4190; 4588; 4756; 5133; 5175; 5176: 5209; 5227; 5231; 5262; 5263; 5299; 5309; 5310; 5312; 5320; 5334; 5340; 5382; 5386; 5399; 5415; 5424; 5430; 5437; 5530; 5601; Galápagos Islands; Niuafu Island; Fiji Islands; Friendly [Tonga] Islands. Present also in the Monaco and *Carnegie* planktons but not found in the other lists and nowhere in any abundance.

Genus GAETANUS Giesbrecht, 1888

GAETANUS ANTARCTICUS Wolfenden

Gaetanus antarcticus Wolfenden, Plankton studies, pt. 1, Copepoda, p. 7, 1905b.

Station H.3798. Two specimens were identified by Sars from this station in the Marquesas Islands. It does not appear in any of the plankton lists here compared but was, however, reported by Brady (1918, p. 19) from the Antarctic Ocean and by Farran (1929, p. 223) from within the Antarctic Circle.

GAETANUS ARMIGER Giesbrecht

Gaetanus armiger Giesbrecht, Atti Accad. Lincei, Rome, ser. 4, vol. 4, sem. 2, p. 335, 1888; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 219, 224, pl. 14, figs. 19, 22, 23, 26, 28, 29; pl. 36, figs. 2, 4, 5, 1892.

Stations 49; 222; 3799; 4644; 4663; 4719; 4722; 4740; 4758. Identified by Sars from 6 of these 9 *Albatross* stations and from 7 Monaco stations and found also in the *Siboga* and *Carnegie* planktons. It is a rare species, and the few specimens that have been found were rather widely scattered.

GAETANUS CURVISPINUS [Sars MS.] Wilson, new species

Plate 10, Figures 108–113

Stations 4700; 4703; 4719; 4721; 4722; 4806; 5185; 5287. Sixteen specimens, including both sexes, were obtained at the first of the above stations. At the other stations the tows were vertical, beginning at 550–200 fathoms, and only one or two specimens were obtained at each.

Female.—Metasome but little narrowed anteriorly and almost squarely truncated posteriorly. Frontal spine small and curved downward close to the surface of the head; no trace of separation between the head and the first segment. Second, third, and fused fourth and fifth segments about the same length but diminishing slightly in width. Spines at the posterior corners of the metasome short, broad, and curved outward at right angles to the body axis, the tips turned dorsally. Urosome 4-segmented, a little more than a fourth as long as the metasome; genital segment longer than wide with nearly straight sides. Abdomen 3-segmented, segments about the same length and as wide as the genital segment. Caudal rami at the

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corners of the anal segment, as wide as long and somewhat divergent, each with four stout setae of equal length.

First antennae reaching three segments beyond the tips of the caudal rami and sparsely setose. The exopod of the second antenna is considerably longer than the endopod and is armed with rather long setae. The exopod of the first leg is 2-segmented, of the other legs 3-segmented; the basipod of the fourth leg has a row of 11 or 12 acicular spines, very similar to the fourth leg of *armiger*. These spines are slightly curved, diminish in length from the outside inwardly, and are crowded closely together as seen in figure 110. Total length 4.75 mm. Metasome 3.70 mm. long.

Male.—Smaller than the female but showing the same proportions; the frontal horn is larger and stands out farther from the forehead (fig. 113). On the contrary, the spines at the posterior corners of the metasome are smaller and scarcely curved at all. The urosome is 5-segmented but no longer than the 4-segmented urosome of the female.

Neither of the first antennae is geniculate; the second pair, the mouth parts, and the first four pairs of legs are like those of the female, the exopod of the first leg 2-segmented. In young males the fifth legs have the form shown in figure 111, the rami of both legs 1-segmented with the exopods showing signs of segmentation. The fifth legs of the adult males are shown in figure 112, the right leg a little longer than the left. The second basipod of this leg is considerably swollen and the endopod is more than half as long as the proximal segment of the expod, narrowed basally and enlarged distally into a bilobed knob. The basal segment of the exopod is one-half longer than the second segment and twice as wide, with a knob on the inner margin at the distal end. The second segment also has a rounded knob at its distal end armed with a small spine; the end segment is a curved and acute spine. The left endopod is short and rodlike; the exopod is 3-segmented, the segments diminishing distally, the end segment tipped with a slender spine. Total length 4.25 mm. Metasome 3.20 mm. long.

Types.—U.S.N.M. No. 70736; station 4700, latitude 20°29′ S., longitude 103°26′ W., Easter to Galápagos Islands.

Remarks.—This species resembles *robustus* but is little more than half as large, has a frontal spine, the first exopod is 2-segmented and the first antennae reach beyond the caudal rami. Unlike *kruppii*, the spines at the posterior corners of the metasome are turned outward and curved upward, and are considerably larger. The details of the fifth legs in the male also contribute to the specific distinction, especially the endopod of the right leg.

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GAETANUS INERMIS Sars

Gaetanus inermis SARS, Bull. Mus. Océanogr. Monaco, No. 26, p. 12, 1905a; Rés. camp. sci. Albert de Monaco, No. 69, p. 64, pl. 19, figs. 3–5, 1925.

Station 4664. A single female was identified by Sars from this station off the Peruvian coast in a vertical tow from a depth of 300 fathoms. The original specimens came from the temperate Atlantic, and the only record since then is by Rose in the Monaco plankton from another station in the temperate Atlantic. Consequently, this *Albatross* female is the first specimen to be obtained from the Pacific.

GAETANUS KRUPPII Giesbrecht

Gaetanus kruppii GIESBRECHT, Mittheil. Zool. Stat. Neapel, vol. 16, p. 202, pl. 7, fig. 8; pl. 8, fig. 29, 1903.

Stations 2; 2195; 3799; 4637; 4642; 4650; 4663–4665; 4667; 4669; 4679; 4681; 4687; 4707; 4711; 4715–4717; 4719; 4722; 4793; 5120; 5185; 5287; H3789. Identified by Sars from 18 of these *Albatross* stations and from 68 Monaco stations and found also in the *Siboga* and *Carnegie* planktons. Sars (Monaco plankton) designated it as one of the most abundant bathypelagic copepods, and this statement receives negative confirmation from the small number of specimens in the *Albatross* plankton, which were mostly taken in surface tows.

GAETANUS LATIFRONS Sars

Gaetanus latifrons SARS, Bull. Mus. Océanogr. Monaco, No. 26, p. 11, 1905a; Rés. camp. sci. Albert de Monaco, No. 69, p. 57, pl. 17, figs. 7–9, 1925.

Stations 3799; 4663; 4683; 4685; 4707; 5120; 5185; 5227; 5287; 5437. This species was found at 1 *Siboga*, 1 *Carnegie*, and 52 Monaco stations and is more abundant in the deeper tows.

GAETANUS MICROCANTHUS [Sars MS.] Wilson, new species

PLATE 11, FIGURES 114–116; PLATE 19, FIGURE 246

Stations 4664; 4667; 4669; 4679; 4681; 4719; 4722. Fifteen specimens, including both sexes, were obtained from these stations off the Peruvian coast and between Easter Island and the Galápagos Islands.

Female.—Metasome short and thick-set, considerably narrowed at both ends; the forehead with a small and slender spine turned downward. The posterior corners of the last segment are broadly rounded, with a minute spine pointing backward. The urosome is less than a third as long as the metasome and is 4-segmented, the segments diminishing in length backward. The genital segment is as wide as long, the sides nearly parallel, the ventral surface with a subrectangular prominence. The three abdominal segments increase slightly in width distally, and the posterior margin of the anal segment is incised at

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its center. The caudal rami are as wide as long, each with five setae, the inner one much shorter than the others, which are about equal.

The first antennae extend about three segments beyond the tips of the caudal rami and are sparsely setose. In the second antennae the exopod is a little longer than the endopod, and both are armed with very long setae. The mouth parts are similar to those of other species but more densely setose. The exopod of the first leg is 2-segmented, but the basal segment shows plainly that it is a fusion of two segments although it has but a single outer spine. The exopod of the second leg is 3-segmented, the endopod 2-segmented, and both rami of the third and fourth legs are 3-segmented. The basipod of the fourth leg carries a row of 15 aciculate spines on its posterior surface just inside the inner margin (fig. 246). These spines diminish in length from the inside outwardly in a manner similar to those of *curvispinus*. Total length 3.35 mm. Metasome 3.30 mm. long, 1.40 mm. wide.

Male.—The body of the male is considerably smaller than that of the female but has the same general proportions. The frontal horn is much reduced in size and cannot be seen at all in dorsal view, and the spines at the posterior corners of the metasome are practically invisible except under magnification, whence the specific name. The exopod of the first leg is 3-segmented, the two basal segments being completely separated, but the first segment still lacks an outer spine. In the fifth legs the second basipod and the two proximal segments of the right exopod are considerably swollen. The terminal exopod segment is as long as the two basal segments combined and is strongly curved near its base. The right endopod is very short and reaches only to the center of the basal exopod segment. The middle segment of the left exopod is longer than either of the others, which are about equal, the end segment being bilobed at its tip. The left endopod is three-fourths as long as the first segment of the exopod and is acuminate. Total length 3.25 mm.

Types.—U.S.N.M. No. 70402; station 4664, latitude 11°30′ S., longitude 87°19′ W., off Peru.

Remarks.—This species resembles *curvispinus* in some details but differs widely in such details as the frontal horn and the spines at the posterior corners of the metasome. The fifth legs of the two males also differ in practically every essential detail.

GAETANUS MILES Giesbrecht

Gaetanus miles GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 4, sem. 2, p. 335, 1888; Fauna und Flora des Golfes von Neapel, Monogr. 19, pp. 219, 224, pl. 14, figs. 21, 24, 25, 27, 30; pl. 36, figs. 1, 3, 1892.

Stations 2; 5–7; 15; 16; 18; 56; 4638; 4648; 4679; 4681; 4687; 4689; 4695; 4699; 4700; 4707; 4717; 4719; 4721–4723; 4730; 4734; 4740;

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5120. This species was very widely distributed and was also found in the Monaco, *Siboga*, and *Carnegie* lists but nowhere abundant. The statement made by Rose in his report on the surface copepods of the Monaco plankton (p. 19), "Les espèces du genre *Gaetanus* vivent exclusivement en profondeur, et ne sont jamais capturées en surface, même la nuit," does not apply to this species. It is true of most of the species, but this one is sometimes captured at the surface even in the daytime.

GAETANUS MINOR Farran

Gaetanus minor FARRAN, Ann. Rep. Fisheries, Ireland, 1902–03, pt. 2, app. 2, p. 34, pl. 5, figs. 1–11, 1905.

Stations 3982; 4678; 4687; 4701; 4719; 4722; 4734; 4753; 5120; 5136; 5246; 5296; Marokau Island anchorage, Low Archipelago. Originally found in the Atlantic by Farran and reported in the Monaco plankton, this species appeared from the Pacific in the *Siboga* and *Carnegie* planktons.

GAETANUS PILEATUS Farran

Gaetanus pileatus FARRAN, Report on the sea and inland fisheries of Ireland for 1901, pt. 2, app. 7, p. 16, pl. 17, figs. 1–11, 1903.

Stations 3800; 4665; 4679; 4683; 4685; 4687; 4700; 4705; 4707; 4708; 4719; 4721; 4722; 4730; 4732; 4734; 4757; 5120; 5185; 5287. Identified by Sars at 15 of these *Albatross* and at 54 Monaco stations; present in the *Siboga* list as *G. caudani*.

GAETANUS RECTICORNIS Wolfenden

PLATE 23, FIGURES 340–341

Gaetanus recticornis WOLFENDEN, Deutsche Südpolar-Exped., 1901–03, vol. 12, Zool., vol. 4, fasc. 4, p. 228, fig. 16a–c; pl. 26, fig. 13, 1911.

Stations 76; 4646; 4655; 4664; 4665; 4676; 4679; 4681; 4717; 4719; 4722. Originally established by Wolfenden upon specimens from the southern Atlantic and not appearing in any of the plankton lists. Hence these *Albatross* specimens identified by Sars from all but one of these stations constitute the first record from the Pacific. The male still remains unknown.

Genus GAIDIUS Giesbrecht, 1895

GAIDIUS AFFINIS Sars

Gaidus affinis SARS, Bull. Mus. Océanogr. Monaco, No. 26, p. 9, 1905a; Rés. camp. sci. Albert de Monaco, No. 69, p. 47, pl. 14, figs. 9–13; pl. 15, figs. 14, 15, 1925.

Stations 4667; 4668; 4669; 4707; 4753; 4760; 5120; 5185; Gilbert Islands. Identified by Sars from the first three of these *Albatross* stations and from 10 Monaco stations and found in limited numbers in the *Carnegie* plankton.

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GAIDIUS BREVICAUDATUS (Sars)

Chiridius brevicaudatus SARS, Bull. Inst. Océanogr. Monaco, No. 101, p. 7, 1907.
Gaidius brevicaudatus SARS, Rés. camp. sci. Albert de Monaco, No. 69, p. 48, pl. 15, figs. 1–13, 1925.

Stations 4700; 4707. Six females from these two stations were identified by Sars as belonging to this species. They are the first to be reported since the species was originally established, and as all the previous specimens were from the Atlantic they are the first recorded from the Pacific.

GAIDIUS BREVISPINUS (Sars)

Chiridius brevispinus SARS, Norwegian North Polar Expedition, vol. 5, Crustacea, p. 68, pl. 19, 1900.
Gaidius brevispinus SARS, Rés. camp. sci. Albert de Monaco, No. 69, p. 48, 1925.

Stations 2195; 2859; 2861; 4638; 4711; 4715; 4721; 4758; 4760; 4793; 4806; 5175; 5176; 5224; 5227; 5230; 5233; 5309; 5312; 5340; 5382. Identified by Sars from 6 of these *Albatross* stations and from 2 Monaco stations and present in the *Carnegie* plankton. It has been reported incidentally by several authors, but this is the first record from the Pacific.

GAIDIUS MINUTUS Sars

Gaidius minutus SARS, Bull. Inst. Océanogr. Monaco, No. 101, p. 10, 1907; Rés. camp. sci. Albert de Monaco, No. 69, p. 49, pl. 14, figs. 14–18, 1925.

Station 4707. Sars identified as belonging to this species four females taken in a vertical tow from a depth of 300 fathoms at this station between Easter Island and the Galápagos. It was reported from the Indian Ocean by Sewell (1929, p. 100).

GAIDIUS PUNGENS Giesbrecht

Gaidius pungens GIESBRECHT, Bull. Mus. Comp. Zool., vol. 25, No. 12, p. 248, pl. 1, figs. 1–4, 1895.

Stations 2; 18; 474; 4574; 4691; 4740. Eight females were identified by Sars from all but one of these stations as belonging to the present species. The original specimens upon which Giesbrecht established the species came from the northern Pacific. Easterly (1905, p. 146) has reported it off the coast of southern California, but it occurs in none of the plankton lists.

GAIDIUS TENUISPINUS (Sars)

Chiridius tenuispinus SARS, Norwegian North Polar Expedition, vol. 5, Crustacea, p. 67, pl. 18, 1900.
Gaidius tenuispinus SARS, Rés. camp. sci. Albert de Monaco, No. 69, p. 46, 1925.

Stations 42; 48; 2195; 3799; 4926; 5030; 5227; 5231; 5246; 5320; Yes Bay, Alaska. Identified by Sars from five Monaco stations and pres-

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ent also in the *Siboga* and *Carnegie* planktons, but nowhere in abundance.

Genus GAUSSIA Wolfenden, 1905

GAUSSIA PRINCEPS (T. Scott)

PLATE 11, FIGURES 117–119

Pleuromma princeps T. SCOTT, Trans. Linn. Soc. London, ser. 2, Zool., vol. 6, pt. 1, p. 42, pl. 3, figs. 8–20, 1894.

Stations 2; 4; 4539; 4542; 4679; 4687; 4707; 4717; 4758. Identified by Sars from 6 of these *Albatross* stations but not found in any of the plankton reports. This is a very large copepod and easily recognized by the peculiar asymmetry of the genital segment. Since figures af the two sexes have appeared together only once the excellent drawings made by Sars are here reproduced. The color of this copepod is very dark, almost black, with the ventral surface of the genital segment a reddish brown. [See remarks under *Metridia atra.*]

Genus HALOPTILUS Giesbrecht, 1898

HALOPTILUS ACUTIFRONS (Giesbrecht)

Hemicalanus acutifrons GIESBRECHT, Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 384, 398, pl. 3, fig. 11; pl. 27, figs. 4, 12, 18, 26; pl. 42, figs. 12, 20, 1892.

Stations 3834; 4634; 5240. Identified by Sars from the second of these 3 *Albatross* and from 22 Monaco stations and found at 15 stations in the *Carnegie* plankton but not in the other lists.

HALOPTILUS ANGUSTICEPS Sars

Haloptilus angusticeps SARS, Bull. Inst. Océanogr. Monaco, No. 101, p. 20, 1907; Rés. camp. sci. Albert de Monaco, No. 69, p. 246, pl. 72, 1925.

Stations 5120; 5190; 5233; 5240. Established by Sars upon specimens from the temperate Atlantic and the Mediterranean and fully described and figured in the Monaco plankton. It was also reported from the Pacific in the *Carnegie* plankton.

HALOPTILUS BULLICEPS Farran

Haloptilus bulliceps FARRAN, Journ. Linn. Soc. London, Zool., vol. 36, No. 243, p. 286, pl. 9, figs. 15, 16; pl. 10, figs. 1–3, 1926.

Station 5246. [The discovery of a single female of this Biscayan species in the Philippines was recorded by Dr. Wilson in his list of identifications of the *Albatross* plankton but not referred to in his manuscript text of this report. It is of interest to note that Farran secured six specimens in the course of 5 to 21 tows made at 100 fathoms in the Bay of Biscay, and one specimen in one of six hauls made between 200 and 100 fathoms. The unique *Albatross* specimen

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(U.S.N.M. No. 73928) was taken in a vertical haul from 100 fathoms to the surface.—W. L. S.]

HALOPTILUS CHIERCHIAE (Giesbrecht)

Hemicalanus chierchiae GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 5, sem. 1, p 813, 1889; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 384, 398, pl. 27, figs. 16, 17, 25; pl. 42, figs. 2, 27, 28, 1892.

Stations 30; 4679; 4730. Identified by Sars from these 3 *Albatross* and from 8 Monaco stations but not present in the other lists.

HALOPTILUS FONS Farran

Haloptilus fons FARRAN, Fisheries Ireland, Sci. Invest. for 1906, pt. 2, p. 69, pl. 7, figs. 11–15, 1908.

Stations 4679; 4711; 5185. Farran's original specimens came from the northern Atlantic west of Ireland, and it was found at one Monaco station in the same region. The present therefore is the first record from the Pacific.

HALOPTILUS LONGICORNIS (Claus)

Hemicalanus longicornis CLAUS, Die freilebenden Copepoden, p. 179, pl. 29, fig. 1, 1863.

Stations 2; 4–7; 15; 18; 26; 3799; 4583; 4587; 4589; 4638; 4648; 4663; 4664; 4667; 4678; 4681; 4685; 4687; 4689; 4691; 4700; 4705; 4707; 4713; 4715; 4717; 4719; 4721; 4724; 4730; 4734; 4740; 4926; 5120; 5185; 5190; 5240; 5246; 5320; 5437; Fiji Islands; Marshall Islands. As will be inferred from the station list, this is the most widely distributed and abundant species of the genus and is found in all the plankton lists.

HALOPTILUS MUCRONATUS (Claus)

Hemicalanus mucronatus CLAUS, Die freilebenden Copepoden, p. 179, pl. 29, fig. 2, 1863.

Stations 27; 5134; 5319. This species appeared in the Monaco plankton, but in none of the other lists; the original specimens came from Messina and it has since been reported by Farran (1929, p. 268) from near New Zealand. The females found at the above *Albatross* stations carry the distribution far to the north of New Zealand into the tropical Pacific.

HALOPTILUS ORNATUS (Giesbrecht)

Hemicalanus ornatus GIESBRECHT, Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 384, 399, pl. 27, figs. 1, 6, 7, 14, 15, 21, 24, 38; pl. 42, figs. 1, 9, 17, 19, 22, 24, 1892.

Stations 3799; 4605, 4634; 4637; 4638; 4655; 4659; 4663–4665; 4667; 4671; 4679; 4681; 4700; 4703; 4707; 4721; 4926; 5120; 5185;

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5227; 5240; 5287; 5320; 5437; 5578. Identified by Sars at 17 of these *Albatross* and at 23 Monaco stations and found in the *Siboga* and *Carnegie* planktons, but everywhere in small numbers.

HALOPTILUS OXYCEPHALUS (Giesbrecht)

Hemicalanus oxycephalus GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 5, sem. 1, p. 813, 1889; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 384, 398, pl. 42, figs. 7, 16, 23, 1892.

Station 3799. This species was originally obtained by Giesbrecht from the tropical Pacific not far from this *Albatross* station. It appeared also in the Monaco and *Carnegie* planktons but has always been reported as rare. These *Albatross* specimens were darker in color and not so transparent as the other species of the genus.

HALOPTILUS SPINICEPS (Giesbrecht)

Hemicalanus spiniceps GIESBRECHT, Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 384, 399, pl. 27, figs. 5, 20, 35, 40; pl. 42, figs. 3, 8, 10, 11, 21, 25, 1892.

Stations 6; 27; 3799; 3803; 4701; 4715; 4730; 5240; 5246; 5422; Fiji Islands. Identified by Sars at six of these *Albatross* and at two Monaco stations and present in the *Siboga* and *Carnegie* planktons. Originally established upon specimens from the western Mediterranean it has been reported from the temperate Atlantic and from the southern and tropical Pacific, but the number of specimens has always been limited.

HALOPTILUS TENUIS Farran

Haloptilus tenuis FARRAN, Fisheries Ireland, Sci. Invest., 1906, pt. 2, p. 68, pl. 7, figs. 16–22, 1908.

Station 3799. The original specimens were obtained from the northern Atlantic off the west coast of Ireland, and it was found at a single Monaco station in the same locality. These *Albatross* specimens came from the Hawaiian Islands and are the first record from the Pacific.

HALOPTILUS VALIDUS Sars

Haloptilus validus SARS, Bull. Inst. Océanogr. Monaco, No. 377, p. 11, 1920; Rés. camp. sci. Albert de Monaco, No. 69, p. 241, pl. 68, 1925.

Station 4700. Identified by Sars from this *Albatross* station near the Galápagos Islands and from two Monaco stations but not present in the other lists.

Genus HARPACTICUS Milne Edwards, 1840

HARPACTICUS CHELIFER (Müller)

Cyclops chelifer MÜLLER, Zoologiae Danicae prodromus, p. 200, 1776.

Beaver Harbor, Vancouver Island, British Columbia; Caldera Bay anchorage west coast of Mindanao, Philippine Islands. This

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harpacticoid frequents the shallow waters along shore and is very widely distributed. It is a bottom form and would not be captured except at anchorages and in harbors and so does not appear in any of the plankton lists. Both of these *Albatross* localities are in the Pacific, one far to the north and the other in the Philippine Islands.

Genus HEMIRHABDUS Wolfenden, 1911

HEMIRHABDUS GRIMALDII (Richard)

Heterochaeta grimaldii Richard, Bull. Soc. Zool. France, vol. 18, p. 151, 1893.

Stations 4663; 4715; 4721; 4724; 5120; 5185. Five females and a male were identified by Sars from the first four, eastern Pacific, stations. It was present at 17 Monaco stations but not in the other planktons. It was first reported from the Pacific area by Sewell (1913, p. 354; 1932, p. 304).

HEMIRHABDUS LATUS (Sars)

Heterorhabdus latus Sars, Bull. Mus. Océanogr. Monaco, No. 40, p. 9, 1905b.
Hemirhabdus latus Sars, Rés. camp. sci. Albert de Monaco, No. 69, p. 232, pl. 64, 1925.

Stations 4719; 4722. Identified by Sars from these two *Albatross* stations between the Galápagos and Paumotu Islands and from four Monaco stations. [It is suggested by Sewell (1932, p. 306) that this species is a synonym of *H. truncatus* (A. Scott).]

Genus HETERAMALLA Sars, 1907

HETERAMALLA DUBIA (T. Scott)

Amallophora dubia T. Scott, Trans. Linn. Soc. London, ser. 2, Zool., vol. 6, pt. 1, p. 55, pl. 4, figs. 1–18, 1894.

Station 3799. Scott's original specimens came from the Gulf of Guinea and were placed in the genus *Amallophora*, but Sars created the new genus above for their reception and fully described them in the Monaco plankton. The species was also present in the *Siboga* plankton and has been reported from the Pacific in the *Carnegie* list.

Genus HETEROPTILUS Sars, 1920

HETEROPTILUS ACUTILOBUS (Sars)

Pontoptilus acutilobus Sars, Bull. Mus. Océanogr. Monaco, No. 40, p. 21, 1905b.
Heteroptilus acutilobus Sars, Rés. camp. sci. Albert de Monaco, No. 69, p. 326, pl. 117, 1925.

Station 4671. Identified by Sars from this single *Albatross* station off the coast of Peru and from 10 Monaco stations but not in the other planktons. In fact, this is the first record since the original discovery and hence of course the first from the Pacific Ocean.

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HETEROPTILUS ATTENUATUS (Sars)

Pontoptilus attenuatus SARS, Bull. Mus. Océanogr. Monaco, No. 40, p. 20, 1905b.
Heteroptilus attenuatus SARS, Rés. camp. sci. Albert de Monaco, No. 69, p. 324, pl. 116, 1925.

Stations 4687; 4700; 4730. Identified by Sars from these *Albatross* stations and from 7 Monaco stations but not appearing in any of the plankton lists. In fact, this is the first record since the original discovery and also the first from the Pacific Ocean, since the original specimens came from the temperate Atlantic.

Genus HETERORHABDUS Giesbrecht, 1898

HETERORHABDUS ABYSSALIS (Giesbrecht)

Heterochaeta abyssalis GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 5, sem. 1, p. 812, 1889; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 373, 383, pl. 19, fig. 4; pl. 20, figs. 29, 30, 1892.

Station 5120. Established by Giesbrecht and placed at first in the genus *Heterochaeta* but afterward (1898, p. 116) transferred to his new genus above. In this last publication the position of the Atlantic station at which his types were taken was erroneously given as "Atlant. Ocean (14° nördl. Br., 132° westl. L.) 4000 m. Tiefe." For 14° north of the Equator the parallel of 132° west longitude is located far out in the Pacific Ocean more than halfway from Mexico to the Hawaiian Islands. The "4000 mi. Tiefe" is the depth at which his tow started, and, since the net was not closed but open all the way up, the specimens could have entered it at any depth above that level. Rose in his paper on Monaco material gives two stations at which this species was found, adding (p. 35), "Cette form est exclusivement bathypélagique," yet at the first of the stations he mentioned the tow was a surface one. The *Carnegie* secured only three specimens in a vertical tow from 1,000 meters, while the single *Albatross* male from station 5120 was captured in a vertical tow from 350 fathoms to the surface.

HETERORHABDUS CLAUSII (Giesbrecht)

PLATE 11, FIGURE 120

Heterochaeta clausii GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 5, sem. 1, p. 812, 1889; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 372, 382, pl. 20, figs. 2, 28, 37, 38, 1892.

Stations 3712; 5185; 5495. One male and three females were obtained at these three stations at depths in the case of the last two ranging from 600 and 550 fathoms to the surface, and at the surface in the case of the first-named station. Three specimens were taken in the *Siboga* plankton in deep vertical tows but none in the other

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planktons. It has never been reported in any abundance and the fact that the few specimens obtained have generally been taken in deep vertical hauls would suggest that it usually stays some distance below the surface. The fifth leg of the female shown in figure 120 indicates the size of the long spine on the inner margin of the second exopod segment, one of the distinctive characters of this species.

HETERORHABDUS NORVEGICUS (Boeck)

Heterochaeta norvegica BOECK, Forh. Vid. Selsk., Christiania, vol. 14, p. 40, 1872.

Stations 2; 42; 470; 4687 ;4701; 4705; 4707; 5185; 5233; 5234. Identified by Sars from 5 of these 10 *Albatross* stations and from 40 Monaco stations and present also in the *Carnegie* plankton. All but the first two of the *Albatross* stations are located in the tropical Pacific. The specific name suggests that this is a northern form and extends even into the Arctic Ocean. Station 2 is located in the North Atlantic between the southern United States and Bermuda, and station 42 is north of the Aleutian Islands.

HETERORHABDUS PAPILLIGER (Claus)

Heterochaeta papilligera CLAUS, Die freilebenden Copepoden, p. 182, pl. 32, figs. 10–13, 15, 1863.

Stations 1; 2; 18; 49; 52; 65; 75; 3799; 3878; 4634; 4652; 4700; 4715; 4719; 4721; 4722; 4725; 4730; 4753; 4759; 4760; 4785; 5120; 5129; 5185; 5227; 5231; 5233; 5263; 5320; 5422; 5437; 5489. Identified by Sars from 14 of these 32 *Albatross* stations and from 37 Monaco stations and found also in the *Siboga* and *Carnegie* planktons.

HETERORHABDUS ROBUSTUS Farran

Heterorhabdus robustus FARRAN, Fisheries Ireland, Sci. Invest. for 1906, pt. 2, p. 65, pl. 7, figs. 1–10, 1908.

Stations 4574; 4634; 5185; 5231. Identified by Sars from the second of these stations and from 7 Monaco stations but not present in the other planktons. Since all the previous specimens have been captured in the Atlantic and Antarctic Oceans, this is the first record from the Pacific.

HETERORHABDUS SPINIFRONS (Claus)

Heterochaeta spinifrons CLAUS, Die freilebenden Copepoden, p. 182, pl. 32, figs. 8, 9, 14, 16, 1863.

Stations 36; 65; 71; 80; 470; 4574; 4646; 4655; 4671; 4685; 4701; 4721; 4722; 4730; 5129; 5134; 5185; 5231; 5233; 5246; 5263; 5320; 5437; Fiji Islands. Identified by Sars from 7 of these *Albatross* stations and from 37 Monaco stations and found in the *Challenger*, *Siboga*, and *Carnegie* planktons.

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Genus HETEROSTYLITES Sars, 1920

HETEROSTYLITES LONGICORNIS (Giesbrecht)

Heterochaeta longicornis GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 5, sem. 1, p. 812, 1889; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 373, 383, pl. 20, figs. 14, 21, 25, 26; pl. 39, fig. 44, 1892.

Stations 7; 15; 16; 2236; 4580; 4583; 4638; 4646; 4652; 4659; 4663; 4667; 4673; 4700; 4707; 4715; 4719; 4722; 5120; 5129; 5185. Identified by Sars from 14 of these *Albatross* stations and from 13 Monaco stations; also present in the *Siboga* and *Carnegie* planktons. The *Siboga* specimens were all taken in deep vertical hauls starting from 750 to 1,500 meters below the surface, and the *Carnegie* specimens, except for one specimen taken in a 50-meter tow and another in a vertical haul from 1,000 meters, were all captured in 100-meter horizontal tows.

HETEROSTYLITES MAJOR (F. Dahl)

Heterochaeta major F. DAHL, Verh. deutsch. zool. Ges., München, vol. 4, p. 79, 1894b.

Station 5185. Two females were obtained at this station between Panay and Negros Islands in the Philippines. Sars found it at five stations in the Monaco plankton and gave a complete description of the female in his report. Farran (1929, p. 267) reported a male and a female from the Antarctic in a vertical haul from 1,750 meters. Although this was the first male to be found, he gave no description or figures but simply said that it showed the usual sexual differences from the female.

Genus ISOCHAETA Giesbrecht, 1889

ISOCHAETA OVALIS Giesbrecht

Isochaeta ovalis GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 5, sem. 1, p. 812, 1889; Fauna und Flora des Golfes von Neapel, monogr. 19, p. 367, pl. 29, figs. 15–17; pl. 38, figs. 33, 34, 1892.

Station 4721. Identified by Sars from this station between the Galápagos and Paumotu Islands and not appearing in any of the plankton lists. Indeed, this is the first and only record since its original discovery in the tropical Pacific and it would seem to be a very rare species. The tow here was a vertical haul from 300 fathoms.

Genus LABIDOCERA Lubbock, 1853

LABIDOCERA ACUTA (Dana)

PLATE 11, FIGURES 121, 122; PLATE 12, FIGURE 123

Pontella acuta DANA, Proc. Amer. Acad. Arts and Sci., vol. 2, p. 30, 1849.
Pontellina acuta DANA, United States Exploring Expedition, 1838–42 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1150, 1853, pl. 80, fig. 12 a-c, 1855.

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Stations 16; 27; 48; 3412; 3878; 3921; 4010; 4190; 4583; 4585; 4588; 4592; 4600; 4605; 4615; 4619; 4638; 4640; 4644; 4952; 5102; 5105; 5110; 5133; 5134; 5175; 5177; 5179; 5180; 5186; 5190; 5191; 5196; 5209; 5211; 5223–5225; 5226; 5228–5232; 5262; 5263; 5299; 5312; 5319; 5340; 5342; 5348; 5382; 5386; 5415; 5434; 5488; 5530; 5553; 5611; 5672; Iloilo Straits; Nasugbu Bay; Port Binangá, Luzon; and Caldera Bay anchorage, west coast of Mindanao, Philippine Islands. For some reason this species was not included in the Monaco plankton, although present in all the other. The numbers at some of the stations run into the hundreds.

LABIDOCERA ACUTIFRONS (Dana)

PLATE 11, FIGURES 124, 125

Pontella acutifrons DANA, Proc. Amer. Acad. Arts and Sci., vol. 2, p. 30, 1849.
Pontellina acutifrons DANA, United States Exploring Expedition, 1838–1842 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1149, 1853; pl. 80, fig. 11 a–h, 1855.

Stations 3; 15; 16; 2195; 2306; 3694; 3791; 3799; 3822; 3829; 3867; 3878; 3901; 3927; 3932; 3980; 3981; 4009; 4010; 4011; 4037; 4190; 4580; 4590; 4615; 4619; 4640; 4644; 4652; 4659; 4661; 4663; 4664; 4667; 4669; 4671; 4673; 4714; 4952; 5105; 5155; 5186; 5262; 5338; 5340; 5358; 5460; 5489; 5530; 5601; Sabtán Island, Philippine Islands. Identified by Sars at 15 of these *Albatross* stations and at 2 Monaco stations; present in all the other planktons except the *Siboga*.

LABIDOCERA AGILIS (Dana)

PLATE 23, FIGURES 342, 343

Pontella agilis DANA, Proc. Amer. Acad. Arts and Sci., vol. 2, p. 30, 1849.
Pontellina agilis DANA, United States Exploring Expedition, 1838–42 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1147, 1853; pl. 80, fig. 10 a–e, 1855.

Stations 3; 27. In the Wilkes plankton Dana established a new species that he named *Pontellina agilis*. The type specimens were captured in the tropical Atlantic north and south of the Equator. This species has not been reported by any subsequent observer but was transferred by Giesbrecht (1898, p. 138) to the present genus and considered of doubtful validity. Five females obtained in surface tow, three near the Virgin Islands in the Lesser Antilles, correspond so completely with Dana's description and figures as to leave no doubt of their identity.

Female.—Metasome elliptical, nearly three times as long as wide; head broadly rounded anteriorly and distinctly separated from the first segment, without lateral hooks. First thoracic segment much longer than the second, third and fourth about the same length, fifth very short. Spines at the posterior corners also short, triangular, acute, and removed inward a little from the corner.

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Urosome, including the caudal rami, about a fourth as long as the metasome and 4-segmented, the genital segment the longest and the anal segment the shortest, all the same width. Caudal rami longer than the anal segment, twice as long as wide and slightly curved like parenthesis marks.

First antennae just reaching the spines at the corners of the metasome and quite slender; exopod of second antenna two-thirds as long as the endopod. The basal segment of the endopod is three times as long as the end segment and the latter has 11 setae. The first four pairs of legs have 3-segmented exopods and 2-segmented endopods. The fifth pair of legs is shown in figure 343, the left leg a little longer than the right. The left exopod is four times as long as the endopod, with two minute spines at the tip and another still smaller on the outer margin below the center. The right exopod is only three and a half times as long as the endopod but otherwise like the left. The endopods are equal in size, bluntly rounded at their tips, and entirely unarmed. Total length 3.15 mm., greatest width nearly 1 mm.

Neotype female.—U.S.N.M. No. 74118.

Remarks.—These copepods are the same size as Dana's specimens, both metasome and urosome are similarly divided, and the ventral eye beneath the rostrum is just as prominent and bright red. Dana adds, "Color blue, especially anteriorly, yellowish posterly," but of course the color has long since disappeared. Thus another of Dana's pioneer copepod species after an interval of about a hundred years has been rediscovered and validated.

LABIDOCERA ALBATROSSI, new species

PLATE 23, FIGURES 344, 345

Station 3878. Four females were found in a surface tow at this station south of Lanai, one of the Hawaiian Islands.

Female.—Metasome elliptical, two and a third times as long as wide, and narrowed a little at each end. Head separated from the first segment and without lateral hooks; dorsal eyes small and widely separated, ventral eye also small and inconspicuous. Fourth and fifth segments fused with rounded posterior corners, the triangular spines not at the corners but on the posterior margin and depressed beneath the dorsal surface. Urosome perfectly symmetrical, one-fourth as wide and, excluding the caudal rami, less than one-sixth as long as the metasome. It is 3-segmented, the segments diminishing in length backward, the first two the same width, the anal segment a trifle wider and obliquely truncated at the corners for the attachment of the caudal rami. The latter are widely separated and curved like parenthesis marks.

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First antennae reaching the abdomen and rather slender; the exopod of the second antenna is a little shorter than the endopod. Fifth legs shown in figure 345, rather stout and asymmetrical, the left longer than the right. The left exopod is three and a half, the right exopod only three, times as long as the respective endopods, which are the same length. Each exopod is tipped with three spines, the middle one the longest, the outer one much larger than the inner. The endopods are fingerlike, unarmed, and bluntly rounded at their tips. Total length 3.50 mm. Metasome 2.80 mm. long, 1.10 mm. wide.

Types.—U.S.N.M. No. 74119; south of Lanai Island, Hawaiian Islands.

Remarks.—This species may be recognized by the stout aspect and perfect symmetry of the entire body, the lack of lateral hooks on the head, the depression of the spines at the posterior end of the metasome, and the shape and wide separation of the caudal rami. The two depressions on each lateral margin of the head are also characteristic.

LABIDOCERA DETRUNCATA (Dana)

PLATE 16, FIGURES 192, 193

Pontella detruncata DANA, Proc. Amer. Acad. Arts and Sci., vol. 2, p. 29, 1849.
Pontellina detruncata DANA, United States Exploring Expedition, 1838–1842 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1143, 1853; pl. 80, fig. 7 a–l, 1855.

Stations 5; 9; 12; 14; 16; 18; 27; 30–32; 36; 3799; 3822; 3867; 3878; 3901; 3980; 4009; 4010; 4011; 4190; 4611; 4615; 4617; 4619; 4635; 4644; 4700; 4720–4723; 4725; 4728; 4731; 4735; 4738; 4740; 4741; 4743; 4952; 5155; 5211; 5262; 5299; 5319; 5530; Iloilo Straits, and Sabtán Island, Philippine Islands. This is the most widely distributed species of the genus in the *Albatross* plankton and was equally abundant in the *Carnegie* plankton. Brady reported it as moderately abundant in the *Challenger* plankton, but in the *Siboga* plankton Scott said it appeared to be rare, and it was not present at all in the Monaco plankton. On the other hand, it sometimes occurs by the hundreds in a surface tow where all the conditions are favorable. Hence, although widely distributed, it must be regarded as erratic in its dispersion and quite susceptible to unfavorable influences.

LABIDOCERA EUCHAETA Giesbrecht

PLATE 25, FIGURES 364, 364′

Labidocera euchaeta GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 5, sem. 2, p. 27, 1889; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 446, 459, pl. 23, fig. 31; pl. 41, figs. 7, 36, 1892.

Stations 16; 31; 3901; 4037; 5175; 5180; 5415. Established by Giesbrecht upon female specimens from Formosa Strait; it does not appear

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in any of the plankton lists. However, Dr. R. B. S. Sewell (1912, pp. 339–344) found development stages of both sexes in the Bay of Bengal, which he described and figured. The right fifth leg of an *Albatross* male is shown in figure 364. This corresponds well with the one shown on Sewell's plate 18, figure 8, "Stage 1." [Dimorph. 1], later called "forma major" (Sewell 1932, p. 361). The fifth legs of the females are also like the figure given by Giesbrecht of his type female.

LABIDOCERA INSOLITA, new species

PLATE 24, FIGURES 346–350

Caldera Bay anchorage, west coast of Mindanao, Philippine Islands. One hundred specimens of a new *Labidocera* species, including both sexes, were taken at this anchorage in a net set in the tide current at the gangway of the steamer and a large catch was made.

Female.—Metasome elliptical, nearly three times as long as wide, considerably narrowed anteriorly but not so much posteriorly. Head separated from the first segment, without lateral hooks and more than half the length of the metasome. Fifth segment very short and rounded at the posterior corners, with small acute spines, both segment and spines perfectly symmetrical. Urosome also perfectly symmetrical and 3-segmented. Genital segment as long as the abdomen and caudal rami combined, its sides a little convex. First abdominal segment twice as long as the anal segment, the latter incised at the center of its posterior margin. Caudal rami nearly as long as the entire abdomen and curved like parenthesis marks.

First antennae reaching the posterior end of the genital segment; exopod of second antenna a little shorter than the endopod, with six setae. The bilobed tip of the endopod is armed with 12 setae, 6 on each of the lobes. The fifth legs are long, slender, and curved; the exopod is twice as long as the endopod and also twice the length of the basipod segment to which it is attached. It is tipped with three spines, the middle one much longer than the other two, but has no spines on the outer margin. The endopod is simple and unarmed, but the tip is contracted into a slender, fingerlike process. The whole endopod is almost as long as the second basipod. Total length 2.54 to 3 mm. Greatest width 0.70 mm.

Male.—Metasome similar to that of the female but not narrowed so much anteriorly, making the head a little wider. Fifth segment with rounded corners and small acute spines like those of the female, the whole symmetrical. Urosome 5-segmented, segments diminishing considerably in length backward but only a trifle in width; like the female, it shows no asymmetry. Caudal rami as long as the last two abdominal

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segments combined, nearly three times as long as wide, a little divergent and straight rather than curved.

First antennae reaching the caudal rami, the right one geniculate and forming a grasping organ similar to the one found in the males of *lubbockii* and *brunescens*. The terminal portion beyond the hinge is made up of four segments, the two proximal ones each about as long as the two terminal ones combined. The proximal one next to the hinge has a serrated ridge running along the lateral margin and extending beyond the distal end. The segment on the other side of the hinge has a spoon-shaped process with a serrated edge, which can be swung around parallel to the ridge on the terminal portion, the two forming a strong grasping organ.

The right fifth leg of the male is stoutly developed, the basal segment triangular, the second segment ellipsoidal, the chela with a strong hand, a curved spoon-shaped finger, and a short curved thumb. The left leg is as long as the right and biramose, the exopod 2-segmented, the end segment with scattered spines on its surface and a long, slender terminal process. The endopod is also 2-segmented, the basal segment as wide as the basal segment of the exopod but not so long. The end segment is a curved cone covered with coiled corrugations. Total length 2.30 to 2.45 mm.

Types.—U.S.N.M. No. 74120; Caldera Bay anchorage, west coast of Mindanao, Philippine Islands.

Remarks.—At first sight this species bears a close resemblance to Czerniavsky's *Labidocera brunescens*, but closer examination reveals many differences. It is one-half larger and has no asymmetry in the fifth segment and its posterior spines or in the urosome, and the details of the fifth legs of both sexes, especially those of the female, are quite different. The stout and well-developed endopod of the left fifth leg of the male is quite uncommon and suggests the specific name.

LABIDOCERA KRØYERI (Brady)

Pontella krøyeri Brady, Voyage of H. M. S. *Challenger*, Zool., vol. 8, pt. 23, Copepoda, p. 93, pl. 39, figs. 1–10, 1883.

Stations 4588; 4611; 4952; 5128; 5133; 5134; 5228; 5342; 5553; Iloilo Straits, Philippine Islands. This species was more widely distributed than *detruncata* in the *Siboga* plankton, was reported in the *Challenger* plankton, but did not appear at all in the Monaco or *Carnegie* planktons.

LABIDOCERA LAEVIDENTATA (Brady)

Plate 24, Figures 351–355

Pontella laevidentata Brady, Voyage of H. M. S. *Challenger*, Zool., vol. 8, pt. 23, Copepoda, p. 93, pl. 38, figs. 1–6, 1883.

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Station 5102. Established by Brady in the *Challenger* plankton upon a single male specimen taken near Sibago Island in the Philippines and given a meager description. Both sexes were obtained in large numbers in the *Siboga* plankton south of Celebes Island and fully described by Scott. Two males and two females were obtained at this *Albatross* station southeast of Luzón Island. In these females the caudal rami are not asymmetrical as in the *Siboga* specimens, and the endopods of the fifth legs are relatively shorter.

LABIDOCERA LUBBOCKII Giesbrecht

Labidocera lubbockii GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 5, sem. 2, p. 20, 1889; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 446, 459, pl. 23, figs. 3, 32, 39; pl. 25, fig. 27; pl. 41, figs. 4, 32, 34, 1892.

Stations 4667; 4926; 5530; Sabtán Island Anchorage, Philippine Islands. Established by Giesbrecht upon specimens obtained at the mouth of the Guayaquil River, Ecuador, a little north of the first of the above *Albatross* stations. Identified by Sars in the *Albatross* plankton from the first of these stations; not found in any of the lists.

LABIDOCERA MINUTA Giesbrecht

PLATE 24, FIGURES 356–359

Labidocera minutum GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 5, sem. 2, p. 27, 1889; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 446, 459, pl. 23, figs. 16, 35, 36; pl. 25, fig. 32; pl. 41, figs. 8, 15, 16, 35, 1892.

Stations 27; 30; 31; 4037; 4952; 5129; 5133; 5175; 5185; 5186; 5208; 5223; 5225; 5228; 5231; 5262; 5267; 5299; 5301; 5319; 5340; 5386; 5422; 5489; 5553. Established by Giesbrecht upon specimens captured near Hong Kong and appearing only in the *Siboga* plankton. Since Giesbrecht's figures are the only ones thus far published, others are here added to show certain characteristics. In a dorsal view of the urosome the anal segment can be easily overlooked, but in a lateral or ventral view it always stands out clearly. In the lateral view (fig. 356) it appears wedge-shaped, the thick end of the wedge ventral, and all three urosome segments are seen to be protuberant ventrally. In the fifth legs of the male the chela of the right leg in these *Albatross* specimens showed two processes on the inner surface of the hand. Between the two processes at the tip of the left leg are two or three spines visible only when one is looking through the space between the processes.

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LABIDOCERA NERII (Krøyer)

PLATE 16, FIGURE 194; PLATE 24, FIGURE 360

Pontia nerii KRØYER, Naturh. Tidsskr. Kjøbenhavn, ser. 2, vol. 2, p. 600, pl. 6, figs. 12–16, 1849.

Stations 13; 15. Identified by Sars from station 13, off the coast of southern Argentina, and station 15, off northern Chile. Found in the Monaco and *Carnegie* plankton lists. In the fifth legs of the female the exopod is six times as long as the endopod and is tipped with three acute spines. The chela of the right fifth leg of the male has two long processes at the proximal corner and the finger closes down between them.

LABIDOCERA ORSINII Giesbrecht

PLATE 24, FIGURES 361–362

Labidocera orsinii GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 5, sem. 2, p. 27, 1889; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 446, 460, pl. 25, fig. 35; pl. 41, figs. 17, 33, 1892.

Station 5225; Sabtán Island Anchorage, Philippine Islands. Originally established by Giesbrecht upon female specimens from the Red Sea, it does not appear in any of the plankton lists. All the specimens obtained at these two *Albatross* localities were also females; the male still remains unknown. In the fifth legs the distinctive characters are the bluntly rounded endopods notched at their tips and the small knobs at the distal corners of the second basipods outside of the exopods. In the lateral view of the urosome the first and second segments of the abdomen are about equal in length, while the anal segment is longer than the other two combined, but only half as high dorsoventrally.

LABIDOCERA PAVO Giesbrecht

PLATE 25, FIGURE 363

Labidocera pavo GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 5, sem. 2, p. 27, 1889; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 446, 460, pl. 25, fig. 34; pl. 41, figs. 18, 38, 1892.

Stations 5105; 5225; Port Binanga, Luzón, Philippine Islands. Established by Giesbrecht upon female specimens from the Red Sea, it does not appear in any of the plankton lists. It was reported from 14 Ceylon stations by Thompson and Scott (1903, p. 251), and adults and immature stages were described and figured by Sewell (1932, p. 365). The species may be recognized at once by the dorsal aspect of the urosome as shown in figure 363. The genital segment has a lateral outgrowth on the right side and a ventrolateral process showing on the left side. The abdomen is 1-segmented, and the caudal rami are kidney-shaped and attached diagonally to the sides of the abdomen.

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The six setae on each ramus all curve inward and form a prominent heart-shaped terminus to the urosome.

LABIDOCERA TENUICAUDA, new species

PLATE 25, FIGURES 365–369

Station 5415; Iloilo Straits, Philippine Islands. Six specimens, including both sexes, were found in the plankton at these two localities in the Philippines.

Female.—Metasome narrowed anteriorly and widened posteriorly; head almost squarely truncated in front with a slight protuberance over the base of the rostrum and without lateral hooks. Fourth and fifth segments separated with small spines on the posterior margins of the latter. Urosome symmetrical, less than a fifth as long and about a sixth as wide as the metasome and made up of three segments. Genital segment as long as the two abdominal segments combined, the latter equal in length but the anal segment widened. Caudal rami twice as long as wide, the inner margins nearly straight, the outer margins strongly convex.

First antennae slender, reaching the posterior end of the metasome; second antennae with the exopod considerably shorter than the endopod. Fifth exopods two and a half times as long as the endopods, each with three outer spines, one at the tip and a minute one on the inner margin at the base of the terminal spine; endopods with simple, pointed, unarmed spines.

Male.—Metasome elongate-elliptical, narrowed at both ends. The posterior corners of the fifth segment are produced into slender spines, which are curved inward and reach the center of the second urosome segment. Urosome, excluding the caudal rami, one-fifth as long as the metasome and 4-segmented, the segments all about the same length and width. Caudal rami longer than the last two abdominal segments combined, six times as long as wide and parallel.

Grasping (right) antenna, shown in figure 367, with a terminal portion made up of four segments, the segment next to the hinge as long as the other three combined and toothed along its inner margin. The segment on the other side of the hinge carries a long inner curved process, toothed on its inner margin. In the fifth legs the hand of the chela on the right leg is stout and has a small thumblike process at its proximal corner. The movable finger is hollowed on its inner side with two spines at the basal end of the hollow; it reaches beyond the base of the hand where it is curved inward and tipped with two curved setae. The second basipod of the left leg has the rudiment of an endopod at its inner distal corner. The two segments of the exopod are set with hairs on their inner surfaces and the end segment is tipped with spines. Total length 1.95 mm. Metasome 1.50 mm. long; 0.65 mm. wide.

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Types.—U.S.N.M. No. 74121; station 5415, latitude 10°07′50″ N., longitude 123°57′ E., between Cebu and Bohol, Philippine Islands.

Remarks.—The principal characters of this species are the squat appearance of the metasome and the symmetry of the urosome in the female, the curved spines at the posterior corners of the fifth segment, and the elongated caudal rami in the male.

LABIDOCERA WOLLASTONI (Lubbock)

Pontella wollastoni Lubbock, Ann. Mag. Nat. Hist., ser. 2, vol. 20, p. 406, pl. 11, figs. 9–11, 18, 1857.

Stations 31; 3878; 4010; 4700. Identified by Sars from the first and last of these *Albatross* stations and from a single Monaco station, and present in the *Carnegie* list. The *Albatross* specimens were taken in surface tows around the Galápagos and Hawaiian Islands and in a vertical tow from 300 fathoms to the surface at station 4700. They constitute the first record from the Pacific Ocean.

Genus LEPEOPHTHEIRUS Nordmann, 1832

LEPEOPHTHEIRUS PARVIVENTRIS Wilson

Lepeophtheirus parviventris Wilson, Proc. U. S. Nat. Mus., vol. 28, p. 635, pl. 23, figs. 275–284, 1905.

Station 3226. A single female was captured at this station in Bering Sea while swimming freely at the surface. It is a parasitic form infesting the Pacific cod and halibut.

Genus LOPHOTHRIX Giesbrecht, 1895

LOPHOTHRIX FRONTALIS Giesbrecht

Lophothrix frontalis Giesbrecht, Bull. Mus. Comp. Zool., vol. 25, No. 12, p. 254, pl. 2, figs. 1–5, 9–12, 1895.

Stations 1; 9; 18; 26; 27; 2859; 4574; 4664; 4665; 4667; 4681; 4687; 4700; 4703; 4705; 4715–4717; 4721; 4722; 4740; 5120; 5185; 5287; 5451; Fiji Islands. Identified by Sars from 19 of these *Albatross* stations and from 40 Monaco stations; present also in the *Siboga* and *Carnegie* planktons.

LOPHOTHRIX HUMILIFRONS Sars

Plate 25, Figures 370–373

Lophothrix humilifrons Sars, Bull. Mus. Océanogr. Monaco, No. 26, p. 22, 1905a; Rés. camp. sci. Albert de Monaco, No. 69, p. 166, pl. 46, figs. 15–22, 1925.

Station 5451. Five males were obtained at this station off the east coast of Luzón in the Philippines. They are different from any males already described in the genus and are referred to the above species whose males have hitherto remained unknown.

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Female (Sars' description).—Metasome oblong, about equally narrowed at each end. Head fused with the first segment and obtusely rounded in front with no trace of a crest. Fifth segment entirely fused with the fourth, the posterior corners narrowly rounded in lateral view. Urosome about a fourth as long and wide as the metasome and 4-segmented; genital segment as wide as long and longer than the first two abdominal segments combined; caudal rami as wide as long and well separated. First antennae reaching the anal segment; second antennae and mouth parts like those of *frontalis*. Fifth legs also similar, but the first two segments are fringed with hairs and the end segment is shorter.

Male.—Metasome elongate-elliptical, nearly three times as long as wide and narrowed but little at the ends. Head fused with the first segment, the two more than half the entire length; frontal margin broadly rounded with no trace of a crest. Fourth and fifth segments completely fused, the posterior corners narrowly rounded in side view. Urosome one-third as long and one-fourth as wide as the metasome and 5-segmented, the basal and anal segments quite short, the three middle segments much longer and of equal length. Caudal rami subcircular in dorsal view and well separated.

First antennae reaching the caudal rami; exopod of the second antennae considerably longer than the endopod. Mouth parts and first four pairs of legs like those of the female; fifth legs somewhat resembling those of *frontalis* but differing in details. The endopod of the right leg is wider at the base and more acuminate at the tip and reaches the center of the second segment of the exopod. The first and second segments of the exopod are enlarged a little at their distal ends and the third segment is curved and laminate. In the left leg the basipods are elongated, the endopod is rudimentary and 1-segmented while the exopod is 2-segmented and hooked at its tip. Total length 5.75 to 6 mm.

Allotype male.—U.S.N.M. No. 74122; station 5451, latitude 13°22′22″ N., longitude 124°00′48″ E., off Bataan, Philippine Islands.

Remarks.—Although there were no females with these males, the latter possess so many of the characteristics of the *humilifrons* females as to leave no doubt that they are the other sex of the species. A single specimen was reported in the *Carnegie* plankton.

LOPHOTHRIX LATIPES (T. Scott)

PLATE 25, FIGURES 374–376

Scolecithrix latipes T. SCOTT, Trans. Linn. Soc. London, ser. 2, Zool., vol. 6, pt. 1. p. 52, pl. 3, figs. 21–23, pl. 5, figs. 40–43, 1894.

Station 5120. Originally established and briefly described by T.

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Scott as a new species of *Scolecithrix* from the Gulf of Guinea, this species was fully described and figured by Sars in the Monaco plankton, but it does not appear in the other plankton lists. Both sexes were found at the above *Albatross* station and are the first record from the Pacific Ocean. All previous specimens have been females, and the male is here described for the first time.

Female.—As described by Sars. Scott stated that the inner terminal spine of the fifth leg "is longer than the others and is finely serrate on the outer margin." Sars made no statement with reference to this spine, but his figure does not show any serration. These *Albatross* specimens showed no serration, but rather a fringe of short plumes.

Male.—Body short and thick-set and quite differently proportioned from that of the female. Metasome elongate-oval but comprising only 62 percent of the entire length, while in the female it is 83 percent. The posterior corners are smoothly rounded and slightly overlap the genital segment. The forehead also is evenly rounded with no trace of a crest, and neither of the first antennae is geniculate. The urosome is only a fourth as wide as the metasome but is considerably more than half as long and 4-segmented. The genital segment is not quite so long as the first two abdominal segments combined but is a little wider. The anal segment is so short as to be easily overlooked and appears to be telescoped into the end of the segment in front of it.

The antennae, mouth parts, and first four pairs of legs are like those of the female; the fifth legs are of the same general pattern as those of *frontalis* but differ in detail. The proximal segment of the right exopod is much widened where it joins the basipod and carries a rounded knob at its distal end on the inner margin. The right endopod is distinctly segmented, the two segments about equal in length. The left endopod is longer than the exopod, each being 3-segmented, and the terminal endopod segment is short and shaped much like the blossom of a calla lily. Total length 3 mm. Metasome 1.85 mm. long.

Allotype male.—U.S.N.M. No. 74123; station 5120, latitude 13°45′30″ N., long. 120°30′15″ E., west of Lubang, Philippine Islands.

Remarks.—The discovery of the male furnishes convincing evidence that Sars was right in transferring the species from the genus *Scolecithrix*, where it was placed by Scott, to the present genus. The fifth legs of the female described by Wolfenden (1911, p. 253) as a new species, *Scolecithrix acutus*, correspond so closely to these of *latipes* that the male must be found before the validity of his species can be admitted.

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LOPHOTHRIX SARSI, new species

PLATE 12, FIGURES 126–136

Station 4687. Four females from this station were identified by Sars as a new species. He drew figures of all the appendages but suggested no name for the new species. Accordingly, the species is named for Sars and his figures are reproduced as a basis for description.

Female.—Metasome elongate-elliptical, nearly three times as long as wide and narrowed but little at each end. Forehead angular in dorsal view, with a sharp apex tipped with a thin median crest projecting dorsally and anteriorly. The anterior surface of the head is prolonged ventrally into a wide and flattened rostrum inclined backward between the bases of the first antennae. This rostrum has convex sides and is narrowed distally with a reentrant tip holding two small juxtaposed spines (fig. 128). The fourth and fifth segments are separated, and the posterior corners of the latter are carried back beyond the center of the genital segment. The urosome is 4-segmented and less than one-sixth as long as the metasome; the genital segment is as wide as long and somewhat flask-shaped, the ventral surface scarcely protuberant. The three abdominal segments are about the same width and length, a little narrower than the genital segment and more than twice as wide as long. The caudal rami are wider than long, and each is armed with four setae as long as the whole urosome.

The first antennae reach the caudal rami and are rather sparsely armed with short setae. The two proximal segments of the exopod of the second antennae are considerably thickened, and the end segment is longer than the second segment. The chewing blade of the mandible has five inner teeth acutely pointed and three outer teeth much larger and bidentate at their tips, and a curved seta at the inner angle. The second maxilla has four inner lobes, the proximal one with four setae, the others with three each, and the terminal segments carry the characteristic cauliflower appendages. The maxilliped is 7-segmented, the segments armed with the following number of setae beginning at the base 6 : 5 : 3 : 3 : 2 : 2 : 3.

In the first leg the endopod just reaches the distal end of the second exopod segment. In the second and third legs there are no spines on the ventral surface of the exopod, and those on the endopod are arranged as in figures 134 and 135. The fifth legs are 3-segmented, and the end segment carries four setae, one, the longest, at the inner distal corner, two terminal, and one at the center of the outer margin, all four nearly parallel. Total length 3.75 mm. Metasome 3.33 mm. long, 1.15 mm. wide.

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Type.—U.S.N.M. No. 70737; station 4687, latitude 22°50′ S., longitude 97°30′ W., Peru to Easter Island.

Remarks.—The first distinguishing character of this representative of the genus is its small size; the only species that approaches it in this respect is *L. latipes*, all the others being much larger. Another character is the jointing of the setae on the swimming legs shown in figures 134 and 135. Again the spines on the end segment of the fifth legs are approximately parallel whereas in the other species they radiate in different directions.

Genus LUBBOCKIA Claus, 1863

LUBBOCKIA ACULEATA Giesbrecht

Lubbockia aculeata GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 7, sem. 1, p. 477, 1891; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 606, 611, pl. 48, figs. 3, 9, 11, 13, 16 20, 1892.

Stations 2; 41; 44; 47; 70; 3834; 5185. Established by Giesbrecht upon specimens from the Pacific far west of the Galápagos Islands and found at 5 *Siboga* and 18 *Carnegie* stations.

LUBBOCKIA BREVIS Farran

Lubbockia brevis FARRAN, Fisheries Ireland, Sci. Invest. for 1906, pt. 2, p. 96, pl. 11, figs. 1–9, 1908.

Station 5437 or 5530. [In the original list of species identified, by stations, this species was recorded as occurring at station 5437, but the only specimens, two females (U.S.N.M. No. 73970), received from Dr. Wilson, are labeled by him as from station 5530. It cannot now be determined whether the species occurred at both these Philippine stations or whether one of the two may be in error. The species has been entered with a question mark under each of these two stations in the lists of species by stations.—W. L. S.]

LUBBOCKIA SQUILLIMANA Claus

Lubbockia squillimana CLAUS, Die freilebenden Copepoden, p. 164, pl. 25, figs. 1–5, 1863.

Stations 65; 3834; 5185; 5320; 5422; 5437; 5530; Sabtán Island, Philippine Islands; Fiji Islands; Niuafu Island. The original specimens upon which this species was established came from Messina, but it is present in all the subsequent plankton lists and appears to be very widely distributed although nowhere at all abundant.

Genus LUCICUTIA Giesbrecht, 1898

LUCICUTIA ATLANTICA Wolfenden

Lucicutia atlantica WOLFENDEN, Journ. Mar. Biol. Assoc., new ser., vol. 7, No. 1, p. 121, 1904.

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Stations 4574; 4638; 4687; 5320; 5437. Identified by Sars from the first 3 of these *Albatross* stations and from 17 Monaco stations but not present in the other planktons.

LUCICUTIA CLAUSII (Giesbrecht)

Leuckartia clausii GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 5, sem. 1, p. 812, 1889; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 359, 367, pl. 19, figs. 5, 6, 12–14, 24, 26, 27; pl. 38, fig. 37, 1892.

Stations 3799; 5320. Identified by Sars from a single Monaco station and found also in the *Siboga* and *Carnegie* planktons.

LUCICUTIA CURTA Farran

Lucicutia curta FARRAN, Ann. Rept. Fisheries Ireland, 1902–03, pt. 2, app. 2, p. 44, pl. 12, figs. 1–7, 1905.

Stations 2195; 3799; 4634; 5102; 5120; 5129; 5185; 5208; 5319. Farran's original specimens came from the northern Atlantic west of Ireland, but he afterward (1929, p. 264) reported it from the Antarctic south of the Pacific. Most of these *Albatross* specimens are from the northern Pacific around the Hawaiian and Philippine Islands. Reported only in the *Carnegie* plankton.

LUCICUTIA FLAVICORNIS (Claus)

Leuckartia flavicornis CLAUS, Die freilebenden Copepoden, p. 183, pl. 32, figs. 1–7, 1863.

Stations 1; 2; 3; 5; 9; 11; 14; 24; 32; 36; 44; 52; 55; 57; 59–61; 63–65; 67; 71; 78; 173; 222; 3799; 3834; 3901; 3932; 4634; 4637; 4638; 4657; 4664; 4679; 4681; 4700; 4703; 4705–4707; 4711; 4717; 4722; 4740; 4753; 4926; 5120; 5129; 5185; 5190; 5228–5231; 5233; 5240; 5246; 5263; 5320; 5422; 5437; 5530; Fiji Islands. This is one of the most widely distributed species of the genus and is found in all the plankton lists except the Wilkes and *Challenger*.

LUCICUTIA GEMINA Farran

Lucicutia gemina FARRAN, Journ. Linn. Soc. London, Zool., vol. 36, No. 248, p. 275, pl. 9, figs. 4–8, 1926.

Stations 5120; 5233. Established by Farran upon specimens taken in the Bay of Biscay and later reported by the same author (1929, p. 263) off New Zealand. The species has not been reported in any of the plankton lists and is evidently limited in its distribution.

LUCICUTIA GRANDIS (Giesbrecht)

Leuckartia grandis GIESBRECHT, Bull. Mus. Comp. Zool., vol. 25, No. 12, p. 258 pl. 4, fig. 4, 1895.

Stations 1; 2195; 4648; 4650; 4652; 4655; 4661; 4663; 4664; 4665; 4667; 4676; 4679; 4687; 4707; 4715; 4717; 4719; 4721; 4722; 5185.

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Identified by Sars from 19 of these *Albatross* and from 47 Monaco stations; present also in the *Carnegie* plankton.

LUCICUTIA LONGICORNIS (Giesbrecht)

Leuckartia longicornis GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 5, sem. 1, p. 813, 1889; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 359, 367, pl. 19, figs. 7, 30; pl. 38, fig. 39, 1892.

Stations 76; 3799; 4701; 4717; 5102; 5120; 5185; 5227; 5228; 5232; 5233; 5287; 5292; 5415. This species does not appear in any of the plankton lists except the *Carnegie* and has been reported otherwise but once since its original discovery.

LUCICUTIA LONGISERRATA (Giesbrecht)

Leuckartia longiserrata GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 5, sem. 1, p. 813, 1889; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 359, 367, pl. 19, figs. 1, 13, 25, 28; pl. 38, fig. 36, 1892.

Station 5319. Originally established by Giesbrecht upon specimens from the tropical Pacific north of the Marshall Islands, it appeared in the *Siboga* and Monaco planktons, in the latter of which it was fully described by Sars.

LUCICUTIA LUCIDA Farran

Lucicutia lucida FARRAN, Fisheries Ireland, Sci. Invest., for 1906, pt. 2, p. 62, pl. 3, fig. 22; pl. 6, figs. 16–20, 1908.

Stations 24; 4644; 5120; 5129; 5185; 5190; 5233; 5301; 5320. Established by Farran upon specimens from the northern Atlantic west of Ireland, it was found also in the Monaco plankton at a single station in the northern Mediterranean but did not appear elsewhere. This is the first record from the Pacific Ocean, where it appears to be more abundant.

LUCICUTIA MACROCERA Sars

Lucicutia macrocera SARS, Bull. Inst. Océanogr. Monaco, No. 377, p. 10, 1920; Rés. camp. sci. Albert de Monaco, No. 69, p. 213, pl. 57, figs. 12–15, 1925.

Stations 5120; 5185. Identified by Sars from a single Monaco station but not found in the other planktons. These are the first specimens taken since the original discovery and the first from the Pacific Ocean.

LUCICUTIA OVALIS Wolfenden

Lucicutia ovalis WOLFENDEN, Deutsche Südpolar-Exped., 1901–1903, vol. 12, Zool., vol. 4, fasc. 4, p. 319, figs. 61 a–c, pl. 35, fig. 6, 1911.

Stations 2195; 5120; 5129; 5186; 5223; 5437. Established by Wolfenden upon female specimens from the northern Atlantic and not appearing in any of the plankton lists. It was reported by Farran (1929, p. 263), however, from off New Zealand, where the male was also found, and by Sewell (1932, p. 290) from the Indian Ocean.

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LUCICUTIA SIMULANS Sars

Lucicutia simulans Sars, Bull. Inst. Océanogr. Monaco, No. 377, p. 11, 1920; Rés. camp. sci. Albert de Monaco, No. 69, p. 216, pl. 58, figs. 9–13, 1925.

Station 5437. Established by Sars in the Monaco report upon specimens of both sexes from the western Mediterranean and not appearing in the other lists. Accordingly, this is the first record since the original discovery, as well as the first from the Pacific Ocean.

LUCICUTIA TENUICAUDA Sars

Lucicutia tenuicauda Sars, Bull. Inst. Océanogr. Monaco, No. 101, p. 18, 1907; Rés. camp. sci. Albert de Monaco, No. 69, p. 212, pl. 57, figs, 7–11, 1925.

Stations 1; 49; 3799; 3800; 3803; 3834; 4010; 4011; 5120; 5185; 5227; 5231; 5233; 5240; 5246; 5263; 5437; 5451. These *Albatross* stations constitute the first Pacific records for the species, which otherwise is known only from two Monaco stations in the temperate Atlantic, whence Sars obtained his original material.

Genus MACANDREWELLA A. Scott, 1909

MACANDREWELLA AGASSIZI, new species

Plate 14, Figures 160–172

Found off Funafuti, Ellice Islands, and identified by Sars as a new species of *Macandrewella* but not specifically named.

Female.—Metasome elliptical, narrowed at both ends; head with the frontal lens as usual; rostrum composed of a bifurcate base tipped with slender filaments. Head fused with the first segment, but the fourth and fifth segments completely separated, the posterior corners of the latter armed with a stout curved spine, which reaches back to the center of the genital segment.

Urosome one-fourth as long as the metasome and 4-segmented; genital segment somewhat asymmetrical, a little more protuberant on the left side and extending farther back on the right side. The dorsal surface is strongly elevated along the midline and near the posterior end is armed with a stout spine which extends back over the first abdominal segment at an angle of 45 degrees. This spine is conspicuous in both dorsal and lateral views and easily identifies the species. The three abdominal segments diminish in length distally, and the second is narrower than either of the others. The caudal rami are wider than long and divergent, each with four setae, the second inner one on the left ramus elongated.

The first antennae reach the posterior margin of the genital segment; the exopod of the second antenna is not quite twice as long as the endopod, the end segment one-half longer than the second segment. Chewing blade of the mandible narrow with three small inner teeth

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and a larger outer one and a curved seta at the outer corner. Second maxilla rather stout, with the inner lobes well developed, each tipped with two long and one short setae, with an extra long one on the proximal lobe. The sensory organs on the two end segments are rather poorly developed. The basal segment of the maxilliped is but little stouter than the second segment, the fourth segment is as long as the three end segments combined, and the setae of the entire appendage are short and weak. Basal segment of first exopod without an inner seta; endopods of second, third, and fourth legs and exopods of the latter with scattered spines as shown in figures 166–168. Fifth legs present and 2-segmented, the proximal segment short, the distal segment tipped with a huge curved spine five times as long as the segment itself with a row of isolated teeth along its outer distal margin. Total length 3 mm. Metasome 1 mm. wide.

Male.—A little smaller than the female, the fourth and fifth segments similarly separated, but the latter without spines. Urosome 5-segmented, the genital segment entirely symmetrical, its dorsal surface not raised and without a spine. Antennae, mouth parts, and first four pairs of legs like those of the female, the fifth legs having the general form found in this genus but differing in detail. The second basipod of the right leg is swollen more than the first and the exopod is 3-segmented, the first segment with a knob at the inner distal corner. The second segment has a sickle-shaped process on its inner margin at the base and projects distally beyond the joint with the third segment. Consequently the third segment is apparently articulated to the inner margin of the second segment instead of to its end. This third segment is bent at right angles near its center and the terminal clawlike part is turned backward and overlaps the sickle process on the base of the second segment. The right endopod is 1-segmented, with a single knob near the center of the outer margin. The two left basipod segments are cylindrical and slender; the two combined reach the tip of the first exopod segment of the right leg. The left exopod is 3-segmented, the proximal segment with an angular process on its inner margin, the two distal segments somewhat widened. The end segment has a rounded process and a soft pointed filament on its inner surface; its rounded tip is covered with hairs. The left endopod is 1-segmented and nearly as long as the exopod, with two angular processes on its outer margin and three minute teeth at its tip. Total length 2.95 mm.

Types.—U.S.N.M. No. 70738; off Funafuti, Ellice Islands.

Remarks.—As characters favoring the placement of this new species in the present genus where Sars placed it, there are the presence of a frontal lens on the head, the absence of a frontal crest, the separation of the fourth and fifth segments, the structure of the rostrum, and

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the general form of the fifth legs of the male. On the other hand, the fifth legs of the female are very similar to *Scottocalanus*.

MACANDREWELLA CHELIPES (Giesbrecht)

PLATE 13, FIGURES 137–147

Scolecithrix chelipes GIESBRECHT, Zool. Jahrb., Abt. Syst., vol. 9, p. 321, pl. 5, figs. 16–22, 1896.

Stations 4732; Fiji Islands; Ellice Islands. Established by Giesbrecht upon a single male taken in the Red Sea and placed in the genus *Scolecithrix*. Scott made a new genus *Macandrewella* in the *Siboga* plankton for the reception of a new species, *joanae*, of which he described both sexes. The male was so similar to the one portrayed by Giesbrecht that he transferred the latter to his new genus. Although the species has been reported since its original discovery, the female has never been mentioned. Sars, however, found both sexes in this *Albatross* plankton and made detailed drawings of the female appendages together with those of the male. They are here reproduced and made the basis of a full description.

Female.—Metasome elliptical, two and a half times as long as wide; head fused with the first segment, fourth and fifth segments completely separated, the latter produced backward and armed with a small curved spine which reaches the center of the genital segment. Rostrum a small flattened lamina bisected for half its length, the branches tipped with soft filaments as long as the lamina. Urosome 4-segmented, genital segment a trifle wider than long and with nearly straight sides; abdomen a little narrower, its three segments diminishing in length posteriorly. Caudal rami wider than long, each with four setae, the second inner one on each ramus lengthened.

First antennae slender and reaching the abdomen; exopod of the second antenna almost twice as long as the endopod, the end segment one-half longer than the second segment. Chewing blade of the mandible abruptly narrowed distally, with two squarely truncated teeth, palp with short rami. Second maxilla with five well-developed inner lobes and two kinds of sensory organs on the end segments. Basal segment of the maxilliped twice the width of the second segment, all the setae short and weak. Basal segment of the first exopod without an inner seta; second and third endopods and third exopod with small spines on their surfaces; fifth legs entirely lacking. Total length 3.50 mm. Metasome 3 mm. long, 1.30 mm. wide.

Male.—Smaller than the female but with the same general body form; the first antennae reach beyond the center of the abdomen; the exopod of the second antenna is only one-fourth longer than the endopod. The mouth parts and the first four pairs of legs are like those

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of the female. The second basipod of the right fifth leg is swollen to about three times the diameter of the first basipod. The first exopod segment has an angular swelling on the outer margin at the center and a small knob at the inner distal corner. The second segment has a curved process at the base and a smaller straight process near the center of the inner margin. The third segment is sickle-shaped, with a knob on the convex margin, the point of the sickle overlapping the base of the second segment. The right endopod is slender and reaches the distal end of the second segment of the exopod. The two basipod segments of the left leg are about equal in length and quite slender, without knobs or swellings. The left exopod is 3-segmented, the two proximal segments equal in length, the end segment much shorter and claw-shaped. The left endopod is 1-segmented, nearly as long as the exopod, and dentate on its inner margin. Total length 3 mm.

Allotype female.—U.S.N.M. No. 67242; Fiji Islands.

Remarks.—In the preceding species the fifth legs of the female consisted of a short basal segment and a very long and stout spine. In the type species *joanae*, described by Scott in the Siboga plankton, the fifth leg of the female consisted of a short basal segment tipped with two still shorter spines. Here and in the following species the fifth legs are entirely lacking in the female. These differences coupled with those shown in the details of the structure of the fifth legs of the male afford a ready means of identifying the four species thus far known in the genus.

MACANDREWELLA SEWELLI Farran

PLATE 13, FIGURES 148–159

Macandrewella sewelli FARRAN, Great Barrier Reef Exped., 1928–29, Sci. Repts., Copepoda, vol. 5, No. 3, p. 106, fig. 17, 1936.

Stations 4734; 5553. Eight specimens, including both sexes, were obtained in a vertical tow from a depth of 300 fathoms at the first of these stations between the Galápagos and Paumotu Islands. Sars labeled this as a new species and made the detailed drawings of it which are here reproduced. But he had been anticipated by Farran (*op. cit.*) who had described a female from deep water outside the Great Barrier Reef of Australia, with which the *Albatross* specimens prove identical. Hence they must bear the name given by Farran. As Farran had only the one sex and gave neither description nor figures of any appendage, Sars' figures have been used to supplement those presented by Farran and to furnish a basis for the description of the male.

Female.—Metasome elliptical, a little more than twice as long as wide; head fused with the first segment and somewhat narrowed; fifth segment separated from the fourth and symmetrical. Urosome 4-seg-

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mented, a little more than one-fifth as long as the metasome; genital segment asymmetrical, with a lobe at the right posterior corner overlapping the first abdominal segment. When seen in lateral view this lobe also projects dorsally and aids greatly in identification. The three abdominal segments diminish in both length and width backward; the caudal rami are wider than long and divergent.

The first antennae reach the posterior end of the genital segment; Farran makes this same statement in his text, but in his figure showing a lateral view of the female the antenna reaches the middle of the caudal ramus. The exopod of the second antenna is nearly twice as long as the endopod, and the end segment is one-half longer than the second segment. The chewing blade of the mandible is narrowed distally and is armed with a large 2-pointed tooth at the outer corner, four smaller acute teeth along the edge and a curved seta at the inner corner. The five inner lobes of the second maxilla differ somewhat in size and the two kinds of sensory organs on the end segments are large and well developed. The basal segment of the maxilliped is twice as wide but not so long as the second segment. Both rami of the second and third legs have spines on the surface, those on the exopods minute, those on the endopods larger but fewer in number. The fifth legs are entirely lacking as in the preceding species. Total length 3.50 to 3.70 mm. Metasome 3.30 mm. long, 1.33 mm. wide.

Male.—Usual form similar to that of the female, but the urosome is 5-segmented and the genital segment is symmetrical without any dorsal process. The antennae, mouth parts, and first four pairs of legs correspond to those of the female, and the fifth legs differ in detail from those of other species. The second basipod of the right leg is swollen to twice the diameter of the first basipod and is fully as wide as long. The first exopod segment extends considerably beyond the articulation with the second segment in the form of a curved finger like process (fig. 158). The outer side of the second segment is articulated with the inner side of the first segment at the base of the finger process. The proximal end of the second segment is enlarged into a trilobed knob, which extends behind the articulation. The end segment is bent at right angles near its center with a long process, toothed at its tip, on the outer angle of the bend. The right endopod extends beyond the second joint of the exopod, is curved and blunt at the tip and has a sharp process on the inner margin near the base and another toward the tip. The left endopod is shorter than the exopod, laminate and truncate at its tip, with a sharp spine at the center of the margin and a row of coarse teeth distal to the spine. The left exopod is also laminate, the second segment enlarged at its distal end with an outer setose process. Total length 3.25 mm.

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Allotype male.—U.S.N.M. No. 70442; station 5553, latitude 5°51′ N., longitude 120°46′30″ E., off Jolo, Philippine Islands.

Remarks.—The protuberance on the dorsal surface of the genital segment in the female and the complicated structure of the male fifth legs are identifying characters.

Genus MACROSETELLA A. Scott, 1909

MACROSETELLA GRACILIS (Dana)

Setella gracilis DANA, Proc. Amer. Acad. Arts and Sci., vol. 1, p. 154, 1847; United States Exploring Expedition, 1838–1842 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1198, 1853; pl. 84, fig. 3 a–g, 1855.

Stations 19–21; 33; 43; 64; 65; 71; 73; 3799; 3800; 3878; 3980; 4037; 4952; 5102; 5120; 5133; 5180; 5186; 5208; 5223; 5227; 5230; 5263; 5301; 5308; 5312; 5320; 5334; 5340; 5349; 5358; 5386; 5399; 5414; 5422; 5424; 5430; 5431; 5437; 5488; 5489; 5530; 5601; 5646; 5647; 5651; Sabtán Island, and Iloilo Straits, Philippine Islands; Fiji Islands; Niuafu Island. This species occurs in all the plankton lists, is pelagic in its habits, and is widely distributed in the Tropics.

Genus MECYNOCERA I. C. Thompson, 1888

MECYNOCERA CLAUSI I. C. Thompson

Mecynocera clausi I. C. THOMPSON, Journ. Linn. Soc. London, vol. 20 (1890), p. 150, pl. 11, 1888.

Stations 2; 3; 7; 9; 11–14; 16; 19–21; 25–27; 29; 32; 33; 35; 36; 39; 41; 44; 52; 54; 62–65; 75; 76; 79; 3799; 3800; 4010; 4190; 4681; 4700; 4701; 4705; 4707; 4715; 5120; 5240; 5320; 5437; Fiji Islands. Identified by Sars from 25 of these *Albatross* stations with four figures and from 6 Monaco stations and present in the *Siboga* and *Carnegie* planktons. It is found in all the larger oceans.

Genus MEGACALANUS Wolfenden, 1904

MEGACALANUS LONGICORNIS (Sars)

Macrocalanus longicornis SARS, Bull Mus. Océanogr. Monaco, No. 26, p. 7, 1905a.
Megacalanus longicornis SARS, Rés. camp. sci. Albert de Monaco, No. 69, p. 11, pls. 1, 2, 1925.

Stations 65; 4652; 4655; 4661; 4663–4665; 4667; 4669; 4671–4673; 4675; 4676; 4679; 4681; 4683; 4700; 4707; 4711; 4715; 5120; 5185; 5287; 5320; 5495; 5553; H. 3789. Identified by Sars from 18 of these *Albatross* stations and 44 Monaco stations; found also in the *Siboga* and *Carnegie* planktons. It is widely distributed, especially in the Tropics.

MEGACALANUS PRINCEPS (Brady)

Calanus princeps BRADY, Voyage of H. M. S. *Challenger*, Zool., vol. 8, pt. 23, Copepoda, p. 36, pl. 4, figs. 3–7, 1883.

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Stations 2859; 3799; 4684; 4687; 4759; 4760; 5185; 5437. Again identified by Sars at 4 of these *Albatross* stations and 4 Monaco stations, found also in the *Siboga* and *Carnegie* planktons.

Genus MESORHABDUS Sars, 1905

MESORHABDUS ANGUSTUS, Sars

Mesorhabdus angustus SARS, Bull. Inst. Océanogr. Monaco, No. 101, p. 19, 1907; Rés. camp. sci. Albert de Monaco, No. 69, p. 236, pl. 66, figs. 14–20, 1925.

Stations 4800; 5185. A single female was found at station 4800 in the Sea of Okhotsk. The species also appeared in the *Albatross* Philippine plankton collections at station 5185, between Panay and Negros. It was first reported from the Pacific area by Sewell (1932, p. 308). The male is still unknown.

Genus METRIDIA Boeck, 1865

METRIDIA ATRA Esterly

PLATE 25, FIGURES 377, 378

Metridia atra ESTERLY, Univ. California Publ. Zool., vol. 3, No. 5, p. 70, pl. 9, figs. 15, 16; pl. 11, figs. 39, 40; pl. 13, fig. 78; pl. 14, fig. 95, 1906.

Station 5287. Originally established by Esterly upon specimens of both sexes taken in plankton hauls off the coast of southern California and not found in any of the plankton lists. Esterly obtained three males and a female, but most of the characteristics he mentions are from the males. To supplement these a figure is here given of the fifth legs of the female (U. S. N. M. No. 74124), which are 4-segmented, with three setae on the end segment, the longest one without plumes. In the endopod of the second legs also the spinal armature of the basal segment is peculiar. Although these *Albatross* specimens have been in preservative for 30 years, they still show plainly the black pigment over the entire surface of the metasome which was cited by Esterly as a prominent specific character. [Sewell (1932, p. 270) has given a description of the development stages of *Gaussia princeps* which leads him to conclude that the form reported by other authors as *Metridia atra* is actually stage V of *G. princeps*. Figure 378 as here drawn by Dr. Wilson corresponds closely to figure 93e of Sewell. Dr. Wilson's statement above that the fifth legs of the female are 4-segmented should be construed as including what other authors consider as the basal segment. This is the system he used in referring to the segments of uniramose legs in the Woods Hole report.—M. S. W.]

METRIDIA BOECKII Giesbrecht

Metridia boeckii GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 5, sem. 2, p. 24, 1889; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 340, 346, pl. 32, fig. 8; pl. 33, figs. 8, 19, 31, 37, 1892.

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Station 4673. Originally established by Giesbrecht upon female specimens from Porto Lagunas and reported by Esterly (1905, p. 178) from the coast of southern California. Identified by Sars from this station off the coast of Peru and from four Monaco stations; present in the *Siboga* plankton.

METRIDIA BREVICAUDA Giesbrecht

Metridia brevicauda GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 5, sem. 2, p. 24, 1889; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 340, 346, pl. 33, figs. 5, 10, 11, 14, 21, 26, 32, 1892.

Stations 35; 36; 2236; 4664; 4756. Giesbrecht's original specimens came from the tropical Pacific and were taken in vertical hauls 1,000 to 4,000 meters in depth. Those taken at six *Siboga* stations were also captured in vertical hauls from considerable depths, whereas the *Albatross* specimens from the first three stations resulted from surface tows; the other two tows were vertical ones from 300 and 75 fathoms, respectively. It was reported also in the *Carnegie* plankton.

METRIDIA CURTICAUDA Giesbrecht

Metridia curticauda GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 5, sem. 2, p. 24, 1889; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 340, 346, pl. 32, fig. 7; pl. 33, figs. 4, 15, 33, 1892.

Stations 4583; 4585; 4646; 4648; 4652; 4664; 4667; 4671; 4673; 4700; 4707; 4721; 4722; 4740; 5129. Identified by Sars from 11 of these tropical Pacific stations. In the *Carnegie* plankton it was found only in the Atlantic. It has also been reported from the Antarctic Ocean by Farran (1929, p. 259) in vertical hauls from considerable depths, and from the Indian Ocean by Sewell (1932, p. 248).

METRIDIA GERLACHEI Giesbrecht

Metridia gerlachei GIESBRECHT, Résultats voyage S. Y. *Belgica*, 1897–99, Rapports scientifiques, Expéd. Antarctique Belge, Zool., Copepoden, p. 27, pl. 5, 1902.

Stations 4; 6; 7; 11; 13; 14; 19; 21. Established by Giesbrecht upon specimens collected during the voyage of the *Belgica* to the Antarctic in 1897 to 1899, and fully described and figured. It does not appear in any of the plankton lists here considered, but has been reported elsewhere from the Antarctic by Brady (1918, p. 25), Wolfenden (1911, p. 286), and Farran (1929, p. 259).

METRIDIA LONGA (Lubbock)

Calanus longus LUBBOCK, Ann. Mag. Nat. Hist., ser. 2, vol. 14, p. 127, pl. 5, fig. 10, 1854.

Stations 1; 10; 31; 34; 41; 42; 48; 49; 50–52; 57; 59; 60; 2195; 2236; 2859; 2861; 3602; 3799; 4685; 4707; 4709; 4757; 4758; 4760;

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4785; 4793; 4800; 4806; 5030; 5120; 5175; 5176; 5185; 5186; 5190; 5227; 5262; 5263; 5287; 5301; 5422; H. 2700; Charles Island, Galápagos. Identified by Sars at 7 of these *Albatross* and at 4 Monaco stations and present in the *Carnegie* but not in the *Siboga* planktons. The species has been considered a cold-water form. Sars (1925, p. 198) has reported it from the Arctic.

METRIDIA LUCENS Boeck

Metridia lucens Boeck, Forh. Vid. Selsk., Christiania, for 1864, p. 238, 1865.

Stations 7; 8; 11; 13; 14; 16; 22; 25; 26; 29; 41; 42; 66; 67; 70; 2236; 4759; 5030; 5196; Yes Bay, Alaska. Identified by Sars from 11 of these *Albatross* and from 8 Monaco stations and found in the *Carnegie* plankton. It is a more temperate form than the preceding species and is often captured in surface tows.

METRIDIA MACRURA Sars

Metridia macrura Sars, Bull. Mus. Océanogr. Monaco, No. 40, p. 7, 1905; Rés. camp. sci. Albert de Monaco, No. 69, p. 197, pl. 54, figs. 1–7, 1925.

[Station 5320. There is a single female from this station in the China Sea in the *Albatross collection* (U.S.N.M. No. 74391). The species was originally described from female specimens from the Atlantic; A. Scott also recorded a single female from the Pacific in the *Siboga* report. Sewell (1913, p. 354) found both sexes in the Indian Ocean and later (1932, p. 249) gave a detailed description.—M. S. W.]

METRIDIA PRINCEPS Giesbrecht

Metridia princeps Giesbrecht, Atti Accad. Lincei, Rome, ser. 4, vol. 5, sem. 2, p. 24, 1889; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 340, 346, pl. 32, fig. 21; pl. 33, figs. 3, 18, 35, 40, 1892.

Stations 1; 2; 9; 18; 4637; 4638; 4663; 4665; 4667; 4668; 4679; 4681; 4683; 4685; 4687; 4700; 4701; 4703; 4705; 4707; 4717; 4719; 4722; 4740; 4747; 4759; 4800; 5120; 5185; 5227; 5228; 5287. Identified by Sars from 26 of these *Albatross* and from 56 Monaco stations and present also in the *Siboga* and *Carnegie* planktons. Although found more often in the warmer portions of the oceans, this species has been reported from the Antarctic (Wolfenden, 1911, p. 287; Farran, 1929, p. 258).

METRIDIA VENUSTA Giesbrecht

Metridia venusta Giesbrecht, Atti Accad. Lincei, Rome, ser. 4, vol 5, sem. 2, p. 24, 1889; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 340, 346, pl. 32, fig. 9; pl. 33, figs. 7, 17, 29, 1892.

Stations 4637; 4638; 4701; 5320; 5437. Identified by Sars from the first three of these five *Albatross* and from nine Monaco stations and present in the *Siboga* plankton.

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Genus MICROSETELLA Brady and Robertson, 1873

MICROSETELLA NORVEGICA (Boeck)

Setella norvegica BOECK, Forh. Vid. Selsk., Christiania, for 1864, p. 281, 1865.

Stations 3; 6; 7; 13–16; 19; 21–23; 25; 26; 33–35; 45; 49; 53; 63; 64; 67; 70; 5175; 5176; 5262; 5320; 5430; 5437; 5601. This minute species was found rather sparingly in both the Atlantic and Pacific Oceans and was usually taken in surface tows. It occurs in all the subsequent plankton lists except the Monaco.

MICROSETELLA ROSEA (Dana)

Canthocamptus roseus DANA, United States Exploring Expedition, 1838–1842 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1189, 1853; pl. 83, fig. 10, 1855.

Stations 34; 36; 41; 42–45; 47; 52; 54; 55; 57; 62–68; 71; 73; 75–77; 79; 80; 82; 4583; 4644; 4663; 4806; 5186; 5234; 5320; 5338; 5340; 5348; 5386; 5399; 5430; 5437; 5601; 5647; 5651; 5657. This is twice the size of the preceding species, and even after long preservation usually retains a rosy tint on the head and anterior part of the body. This copepod is present in all the plankton lists except the *Challenger;* in the *Carnegie* plankton it was found at 70 percent of all the stations.

Genus MIRACIA Dana, 1846

MIRACIA EFFERATA Dana

Miracia efferata DANA, Proc. Amer. Acad. Arts and Sci., vol. 2, p. 46, 1849; United States Exploring Expedition, 1838–1842 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1260, 1853; pl. 88, fig. 11, 1855.

Stations 4037; 5246; 5334; 5386; 5437. This small copepod was found in very limited numbers in all the planktons except the *Siboga.* It appears most frequently in surface tows.

Genus MONACILLA Sars, 1905

MONACILLA SEMISPINA (A. Scott)

PLATE 26, FIGURE 379

Monacilla dubia A. SCOTT, Copepoda of the *Siboga*-Expedition, monogr. 29a, pt. 1, p. 35, pl. 3, figs. 17–29, 1909.

Station 5246. A single male (U.S.N.M. No. 74125) was captured in a vertical haul from a depth of 100 fathoms at this station east of Mindanao. It corresponds exactly with Scott's description and figures of a single male from the Banda Sea, which he made a new species with the name *Monacilla dubia* on page 35 of the *Siboga* report. But on an earlier page, page 33, he described another new species, *Oxycalanus semispinus*, founded on females alone. However,

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Farran's (1908, p. 25) genus *Oxycalanus* is a synonym of Sars' (1905a, p. 8) genus *Monacilla*. Making this correction in the *Siboga* report we find that Scott's two new species are brought together in the same genus, *semispina*, based on females only, and *dubia*, based on a single male. Furthermore, as two of the *Albatross* females came out of the same deep haul as the single male, the conclusion that they are the male and female of the same species, as suggested by Sars in the Monaco plankton, is inevitable.

MONACILLA TYPICA Sars

PLATE 26, FIGURE 380

Monacilla typica SARS, Bull. Mus. Océanogr. Monaco, No. 26, p. 9, 1905a; Rés. camp. sci. Albert de Monaco, No. 69, p. 38, pl. 11, figs. 1–15; pl. 12, figs. 1–10, 1925.

Stations 5120; 5246; 5437. Named and diagnosed by Sars in 1905, both sexes were fully described and figured in the Monaco plankton, but it does not appear in the other lists. Sars considered Scott's *Oxycalanus semispinus* and *Monacilla dubia* synonyms of his own *Monacilla typica*. But the fifth legs of the males as here shown are certainly those of different species, as can be seen by comparing the two figures. The females also seem specifically distinct in the proportions of metasome and urosome, in the symmetry or asymmetry of the genital segment, and in the details of the various appendages, especially the third and fourth pairs of legs. There are then three species of *Monacilla*, these two and Sars' species *tenera* distinguished by a frontal crest. A male of this species (*typica*) from station 5120, has been given U.S.N.M. No. 74126.

Genus MONSTRILLA Dana, 1849

MONSTRILLA CLAVATA Sars

Monstrilla clavata SARS, Crustacea of Norway, vol. 8, p. 14, pl. 6, 1921.

Two females were obtained at Caldera Bay anchorage, west coast of Mindanao, Philippine Islands. The species is not found in any of the plankton lists but is fully described and figured in Sars' account (*op. cit.*).

MONSTRILLA LEUCOPSIS Sars

Monstrilla leucopsis SARS, Crustacea of Norway, vol. 8, p. 15, pl. 7, 1921.

A single female was taken in company with the preceding species at the Caldera Bay anchorage, west coast of Mindanao, Philippine Islands. It also is not found in any of the plankton lists but was described and figured by Sars (*op. cit.*).

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MONSTRILLA SERRICORNIS Sars

Monstrilla serricornis SARS, Crustacea of Norway, vol. 8, p. 19, pl. 10, fig. 1, 1921.

Four males were taken in a surface tow at Butaritari Lagoon in the Gilbert Islands and two more in company with the preceding species at the Caldera Bay anchorage, west coast of Mindanao, Philippine Islands. The records of these three *Monstrilla* species are the first from the Pacific Ocean, and the present species is the only one heretofore reported since the original discovery.

Genus MORMONILLA Giesbrecht, 1891

MORMONILLA MINOR Giesbrecht

Mormonilla minor GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 7, sem. 1, p. 475, 1891; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 532, 537, pl. 43, figs. 27, 33, 1892.

Station 4700. Three females were identified by Sars from this station between Easter Island and the Galápagos Islands. Since this species does not appear in any of the plankton lists, this is the first record since the original discovery in the eastern Pacific off the coast of Ecuador.

MORMONILLA PHASMA Giesbrecht

Mormonilla phasma GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 7, sem. 1, p. 474, 1891; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 532, 536, pl. 43, figs. 28–32, 34–41, 1892.

Stations 3799; 4676; 4679; 4707; 5185; 5437. The second species of this remarkable genus is rather better known than the preceding one and was recorded from four *Siboga* stations but does not appear in the other lists. It was found by T. Scott (1894, p. 64) in considerable numbers in the Gulf of Guinea in tow from a depth of 235 fathoms.

Genus NANNOCALANUS Sars, 1925

NANNOCALANUS MINOR (Claus)

Cetochilus minor CLAUS, Die freilebenden Copepoden, p. 172, 1863.

Stations 2; 6; 16; 27; 31; 39; 41; 43; 44; 47; 53; 55; 57; 71; 77; 79; 2236; 3765; 3789; 3799; 3829; 3867; 3901; 3912; 4010; 4190; 4588; 4611; 4635; 4640; 4644; 4646; 4655; 4659; 4663; 4664; 4673; 4684; 4700; 4703; 4707; 4710; 4715; 4719; 4721; 4723; 4738; 4743; 4850; 4952; 5120; 5129; 5155; 5175; 5180; 5185; 5186; 5190; 5191; 5196; 5208; 5223–5225; 5228; 5229; 5231; 5234; 5246; 5262; 5263; 5299; 5301; 5309; 5319; 5320; 5338; 5340; 5382; 5386; 5388; 5396; 5397; 5410; 5411; 5414; 5415; 5424; 5437; 5530; 5553; 5646; 5647; 5651; Sabtán Island, Philippine Islands; Fiji Islands; Charles Island, Galápagos. This is one of the most widely distributed of the calanoids. It appears in all the plankton lists except the *Challenger* and is abundant in all, especially in the Monaco one.

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Genus NEOCALANUS Sars, 1925

NEOCALANUS GRACILIS (Dana)

Calanus gracilis DANA, Proc. Amer. Acad. Arts and Sci., vol. 2, p. 18, 1849; United States Exploring Expedition, 1838–1842 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1078, 1853; pl. 74, fig. 10, 1855.

Stations 5; 6; 9; 16; 18; 30; 49; 55; 59; 60; 64–67; 69; 236; 2195; 3799; 3800; 3829; 3834; 3867; 3878; 3901; 3912; 3932; 4009; 4010; 4037; 4190; 4588; 4635; 4644; 4653; 4684; 4688; 4689; 4694; 4700; 4706; 4721; 4722; 4725; 4731; 4738; 4750; 4760; 4926; 4952; 5120; 5129; 5133; 5134; 5155; 5175; 5180; 5185; 5186; 5190; 5196; 5209; 5224; 5225; 5230; 5233; 5234; 5240; 5246; 5263; 5299; 5312; 5319; 5320; 5338; 5340; 5342; 5382; 5386; 5397; 5414; 5415; 5422; 5437; 5530; 5601; 5647; H. 2700; Iloilo Straits, Philippine Islands; Fiji Islands. Another very widely distributed calanoid found in all the plankton lists except the *Challenger*, with the number of specimens reaching the hundreds.

NEOCALANUS ROBUSTIOR (Giesbrecht)

Calanus robustior GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 4, sem. 2, p. 332, 1888; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 91, 129, pl. 7, figs. 15, 19, 25, 30; pl. 8, fig. 34, 1892.

Stations 3; 5; 6; 7; 15; 16; 44; 236; 2807; 2859; 3799; 3800; 3803; 3829; 3878; 3901; 4009; 4010; 4037; 4674; 4678; 4679; 4681; 4683; 4685; 4687; 4689; 4692; 4701; 4703; 4705; 4707; 4722; 4730; 4731; 4734; 4740; 4926; 5030; 5120; 5129; 5133; 5234; 5284; 5301; 5340; 5386; 5399; 5422; 5437; Fiji Islands. This species was also found at 10 *Siboga*, 14 Monaco, and 70 *Carnegie* stations, the preponderance in the latter plankton probably due to the fact that more tows were taken at the surface.

NEOCALANUS TENUICORNIS (Dana)

Calanus tenuicornis DANA, Proc. Amer. Acad. Arts and Sci., vol. 2, p. 15, 1849; United States Exploring Expedition, 1838–1842 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1069, 1853; pl. 73, fig. 10 a, b, 1855.

Stations 1; 3799; 3800; 3878; 3901; 3932; 4190; 4926; 4942; 4952; 5185; 5186; 5223; 5320; 5340; 5399; 5415; 5422; 5437; Fiji Islands; Charles Island, Galápagos. Identified by Sars from 10 Monaco stations and found also at 1 *Siboga* and 52 *Carnegie* stations. It is not so widely distributed as the two preceding species and is limited in numbers.

Genus OCULOSETELLA F. Dahl, 1895

OCULOSETELLA GRACILIS (Dana)

Miracia gracilis DANA, Proc. Amer. Acad. Arts and Sci., vol. 2, p. 46, 1849; United States Exploring Expedition, 1838–1842 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1261, 1853; pl. 88, fig. 12 a–c, 1855.

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Stations 7; 8; 34; 35; 42; 4700; 5301; 5320; Fiji Islands. Found at 2 Wilkes, 3 Monaco, and 26 *Carnegie* stations but not present in the *Siboga* plankton. This is the species named *Miracia gracilis* by Dana, but Sars (1916, p. 13) recognized that it did not belong in that genus but was rather a true *Setella*. However, the type species of *Setella* already bore the name *gracilis*. Hence, if Dana's species was to be transferred to the genus *Setella* its specific name had to be changed, so Sars called it *Setella oculata*, which later became the *Macrosetella oculata* of Rose (1929, p. 54) and subsequent authors. However, F. Dahl (1895, p. 171) stated that Dana's species differed enough from the other Setellidae to warrant the establishment of a new genus for it, suggesting the name *Oculosetella*. Placing it in this hitherto unrecognized genus permits the retention of the specific name given to it by Dana. It is a rare species, and two specimens are usually the most obtained in a single tow, though at station 4700 four females and one male were captured.

Genus OITHONA Baird, 1843

OITHONA LINEARIS Giesbrecht

Oithona linearis GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 7, sem. 1, p. 475, 1891; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 538, 548, pl. 34, figs. 1, 2, 40, 1892.

Stations 11; 23; 29; 46; 47; 52–55; 59; 61; 63; 64; 67; 3799; 5120; 5209; 5246; 5263; 5320; 5348; 5399; 5437; Niuafu Island. Originally obtained from the tropical Pacific by Giesbrecht and otherwise reported only in the *Carnegie* plankton list. Only a single specimen was obtained at most of these *Albatross* stations and the highest number was three.

OITHONA PLUMIFERA Baird

Oithona plumifera BAIRD, Zoologist (Newman), vol. 1, p. 59, fig. b, 1843.

Stations 4; 34; 43; 44; 75; 76; 4700; Fiji Islands. A single female was obtained at each of these stations except the last two, where collections of from 30 to 50 specimens including both sexes were obtained. The species appears in all the plankton lists except the *Challenger*, but always in very small numbers. It seems to stay at or near the surface and is not likely to be found in a deep tow.

OITHONA ROBUSTA Giesbrecht

Oithona robusta GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 7, sem. 1, p. 475, 1891; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 538, 549, pl. 34, figs. 4, 5, 16, 17, 23, 30, 31, 43, 1892.

Stations 2195; 2806; 3765; 4676. This species, originally described from the tropical Pacific, was taken once by the *Carnegie* a little east

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of the type locality. Farran again records it from the tropical Pacific (1936, p. 124) and also from the Indian Ocean (1913, p. 184). Not appearing in any of the other plankton lists, it is, however, reported from the Adriatic near Venice by Pesta (1920, p. 554). The *Albatross* has established its presence in the Atlantic (station 2195), besides taking it off Peru, in the Galápagos Islands, and in Japanese waters.

OITHONA SIMILIS Claus

Oithona similis CLAUS, Die Copepoden-Fauna von Nizza, p. 14, 1866.

Stations 2–4; 6; 7–9; 11; 12; 19–22; 24–27; 29; 33–35; 42; 44–47; 49; 51; 55; 57–60; 62–64; 66; 67; 73; 75; 76; 2195; 2806; 3765; 3799; 3829; 3980; 4010; 4037; 4756; 4759; 4926; 5120; 5129; 5133; 5155; 5175; 5176; 5185; 5190; 5208; 5224; 5225; 5227; 5228; 5231; 5240; 5246; 5262; 5309; 5319; 5320; 5340; 5348; 5387; 5415; 5437; 5651; Sabtán Island, Philippine Islands; Fiji Islands. This is probably the most widely distributed species of the genus, but in spite of the long list of stations it must be classed as comparatively rare in the *Albatross* plankton. In his "Crustacea of Norway," Sars (1913, p. 8) makes a statement that is supported by the present plankton: "Male specimens are much scarcer than females, and seem only to appear in certain seasons." The species was included in the Monaco and *Carnegie* lists.

OITHONA SPINIROSTRIS Claus

Oithona spinirostris CLAUS, Die freilebenden Copepoden, p. 105, pl. 11, figs. 4–9, 1863.

Stations 10; 25; 60; 65; 67; 3799; 5120; 5246; 5338; 5437; Fiji Islands. This is another species of which both sexes were described and figured by Sars (1913, p. 6). It appears also in the *Carnegie* and *Challenger* planktons.

Genus OITHONINA Sars, 1913

OITHONINA NANA (Giesbrecht)

Oithona nana GIESBRECHT, Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 538, 549, pl. 4, fig. 8; pl. 34, figs. 10, 11, 20, 24, 26, 34, 35, 42; pl. 44, figs. 2, 4, 6, 1892.

Taken at the surface, south of the Suva Light, in the Fiji Islands; found also in the *Carnegie* plankton but not in the others.

Genus ONCAEA Philippi, 1843

ONCAEA CONIFERA Giesbrecht

Oncaea conifera GIESBRECHT, Atti Accad. Lincei Rome, ser. 4, vol. 7, sem. 1, p. 477, 1891; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 591, 603, pl. 2, fig. 10; pl. 47, figs. 4, 16, 21, 23, 28, 34–38, 42, 55, 56, 1892.

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Stations 41; 65; 73; 3782; 3799; 5120; 5231; 5246; 5262; 5263; 5296; 5320; 5424; 5437; 5495. This species was also found at 3 *Siboga*, 4 Monaco, and 24 *Carnegie* stations, and it has been reported from both the Arctic (Mrázek, 1902, p. 517) and Antarctic (Wolfenden, 1911, p. 362; Farran, 1929, p. 285) Oceans. Since these *Albatross* stations are mostly in the tropical Pacific, the species is evidently not much influenced in its distribution by temperature.

ONCAEA MINUTA Giesbrecht

Oncaea minuta GIESBRECHT, Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 591, 603, pl. 47, figs. 3, 6, 26, 46, 59, 1892.

Stations 2; 12; 19; 22; 25; 27; 31; 36; 39; 51; 57; 62; 63; 65; 66; 70; 71; 73; 75; 76; 81; 3712; 3765; 3799; 3800; 3829; 3834; 3867; 3878; 3901; 3912; 3930; 3980; 4009; 4010; 4011; 4037; 4190; 4588; 4663; 4926; 4952; 5120; 5129; 5133; 5134; 5185; 5186; 5225–5227; 5231; 5233; 5234; 5240; 5246; 5262; 5263; 5299; 5308; 5309; 5312; 5320; 5338; 5340; 5348; 5349; 5382; 5386; 5387; 5397; 5399; 5410; 5411; 5415; 5430; 5437; 5488; 5507; 5530; 5601; 5646; 5651; Sabtán Island and Iloilo Straits, Philippine Islands; Fiji Islands; Niuafu Island. Identified by Sars from 9 of these *Albatross* stations but not present in the Monaco plankton. It was taken at 5 *Siboga* and 110 *Carnegie* stations, nearly always in surface tows.

ONCAEA NOTOPA Giesbrecht

Oncaea notopus GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 7, sem. 1, p. 477, 1891; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 591, 603, pl. 47, figs. 12, 15, 45, 1892.

Stations 34; 66; 67; 71; 73; 75; 3878; 5224. Established by Giesbrecht upon specimens from the tropical Pacific and given a detailed description by Sars (1900, p. 107). Present only in the *Carnegie* plankton.

ONCAEA ORNATA Giesbrecht

Oncaea ornata GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 7, sem. 1, p. 477, 1891; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 591, 604, pl. 44, figs. 50, 51; pl. 47, figs. 20, 24, 49, 53, 1892.

Stations 3829; 5175; 5190; 5226; 5240; 5319. Another species established upon specimens from the tropical Pacific and not appearing in any of the plankton lists except the *Carnegie*, where it was also confined to the tropical Pacific.

ONCAEA SIMILIS Sars

Oncaea similis SARS, Crustacea of Norway, vol. 6, p. 193, pl. 109, fig. 1, 1918.

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Stations 39; 42; 43; 45; 55; 62; 65; 71; 73; 3829; 5133; 5186; 5190; 5223; 5225; 5228; 5240; 5434. Established upon specimens from the Norwegian fjords and appearing only in the *Carnegie* plankton list.

ONCAEA VENUSTA Philippi

Oncaea venusta PHILIPPI, Arch. f. Naturg. (Wiegmann), vol. 1, Jahrg. 9, p. 63, pl. 3, fig. 2, 1843.

Stations 7; 12; 16; 19; 21; 22; 24; 31; 34; 36; 39; 41; 42; 44; 46; 47; 49; 52; 53; 57; 59; 60; 62; 63; 65–68; 70; 71; 75–80; 82; 2806; 3932; 3980; 4009; 4037; 4611; 4644; 4671; 4707; 4731; 5102; 5133; 5155; 5175; 5180; 5185; 5186; 5190; 5196; 5208; 5223; 5225; 5228; 5231; 5233; 5246; 5262; 5301; 5308; 5312; 5219; 5320; 5338; 5340; 5348; 5382; 5386; 5399; 5412; 5415; 5434; 5437; 5507; 5530; 5553; 5646; 5651; Sabtán Island, Philippine Islands; Fiji Islands; Niuafu Island; Charles Island, Galápagos. Found also at 30 Monaco, 59 *Siboga*, and 102 *Carnegie* stations, nearly always in surface tows.

Genus ONCHOCALANUS Sars, 1905

ONCHOCALANUS AFFINIS With

PLATE 26, FIGURE 381

Onchocalanus affinis WITH, Danish Ingolf-Expedition, vol. 3, pt. 4, p. 233, figs. 75a–e, 76a–d, 1915.

Stations 4679; 5120. From the first of these stations between Callao, Peru, and Easter Island, Sars identified two females, and from a Monaco station in the northern Atlantic one female. Also from the second *Albatross* station, in the Philippines, only one female was taken. With's original specimens were a single male and female from the northern Atlantic. The *Albatross* specimens therefore are the first to be reported from the Pacific. The fifth leg of the female has one or two additional spines on the outer margin of the end segment.

ONCHOCALANUS CRISTATUS (Wolfenden)

Xanthocalanus cristatus WOLFENDEN, Journ. Mar. Biol. Assoc. United Kingdom, new ser., vol. 7, No. 1, p. 119, pl. 9, figs. 18, 19, 1904.

Stations 4707; 5185; 5231. Three females were captured at the first station, located between Easter Island and the Galápagos, a single female at the second station, in the Philippines, and two females at the last station, also in the Philippines. The species was also reported from 1 *Carnegie*, 2 *Siboga*, and 4 Monaco stations, but all females in very small numbers.

ONCHOCALANUS HIRTIPES Sars

Onchocalanus hirtipes SARS, Bull. Mus. Océanogr. Monaco, No. 26, p. 20, 1905a; Rés. camp. sci. Albert de Monaco, No. 69, p. 148, pl. 41, figs. 6–11, 1925.

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Stations 4667; 4715; 5120; 5185; 5231. Identified by Sars at the first two of these *Albatross* and at four Monaco stations. Reported otherwise only in the *Siboga* plankton.

ONCHOCALANUS STEUERI Pesta

Onchocalanus steueri PESTA, Zool. Jahrb. (Abt. Syst.), vol. 43, p. 516, pl. 8, figs. 1–11, 1920.

Station 5185. A single female was found at this Philippine station. The species was described from the southern Adriatic and does not appear in any of the plankton lists.

ONCHOCALANUS TRIGONICEPS Sars

Onchocalanus trigoniceps SARS, Bull. Mus Océanogr. Monaco, No. 26, p. 20, 1905a; Rés. camp. sci. Albert de Monaco, No. 69, p. 144, pl. 40, 1925.

Stations 4665; 4676; 4679; 4717; 4740; 5320. Identified by Sars from 5 of these *Albatross* and 27 Monaco stations, thus becoming the most widely distributed species of the genus. It was also present in the *Carnegie* plankton.

Genus PACHOS Stebbing, 1910

PACHOS PUNCTATUM (Claus)

Pachysoma punctata CLAUS, Die freilebenden Copepoden, p. 163, pl. 25, figs. 6–11, 1863.

Stations 4615; 4681; 4721; 4724; 4734; 4793; 5185; 5225. A single female was obtained at all of these stations except 4734 where some 25 specimens were secured; the species was also present at a single *Challenger* station, at four *Siboga* stations, and at nine *Carnegie* stations.

Genus PACHYPTILUS Sars, 1920

PACHYPTILUS ABBREVIATUS (Sars)

Pontoptilus abbreviatus SARS, Bull. Mus. Océanogr. Monaco, No. 40, p. 19, 1905b.
Pachyptilus abbreviatus SARS, Rés. camp. sci. Albert de Monaco, No. 69, p. 319, pl. 113, 1925.

Stations 3799; 4664; 4665; 4667; 4671; 4676; 4679; 4681; 4685; 4688; 4700; 4711; 4719; 4747; 4760; 5190; Fiji Islands; Ellice Islands. Identified by Sars from 11 of these *Albatross* stations and from three Monaco stations. It was reported first from the Pacific in the *Carnegie* plankton. The above list of stations shows that the species is more widely distributed in that ocean than in the Atlantic, where it was originally found.

PACHYPTILUS EURYGNATHUS Sars

Pachyptilus eurygnathus SARS, Bull. Inst. Océanogr. Monaco, No. 377, p. 18, 1920; Rés. camp. sci. Albert de Monaco, No. 69, p. 321, pl. 114, 1925.

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Stations 4671; 4679; 4705; 4717; 4760; 4765; 4793. Identified by Sars from three of these seven *Albatross* stations and from three Monaco stations but not present in the other plankon lists. These are the first specimens to be obtained since the establishment of the species, as well as the first from the Pacific Ocean.

Genus PARACALANUS Boeck, 1865

PARACALANUS ACULEATUS Giesbrecht

Paracalanus aculeatus GIESBRECHT, Atti. Accad. Lincei, Rome, ser. 4, vol. 4, sem. 2, p. 332, 1888; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 164, 170, pl. 9, figs. 20, 26, 30, 1892.

Stations 9; 12; 13; 14; 16; 18; 24; 27; 30; 32; 41; 54; 58; 61; 65; 81; 4743; 5263; 5399; 5412; 5437. Identified by Sars from 11 of these *Albatross* stations and from one Monaco station and found at 37 *Siboga* stations and in the *Carnegie* plankton, everywhere in very small numbers.

PARACALANUS NANUS Sars

Paracalanus nanus SARS, Bull. Inst. Océanogr. Monaco, No. 101, p. 4, 1907; Rés. camp. sci. Albert de Monaco, No. 69, p. 26, pl. 6, figs. 10–17, 1925.

Stations 5227, 5229, 5231; only a few females were taken at these Philippine stations. It was reported from the Indian Ocean by Sewell (1929, p. 71).

PARACALANUS PARVUS (Claus)

Calanus parvus CLAUS, Die freilebenden Copepoden, p. 173, pl. 26, figs. 10–14; pl. 27, figs. 1–4, 1863.

Stations 1–4; 6–8; 10; 11; 14; 16; 19–23; 25; 27; 29; 30; 32–36; 39; 42; 44; 47; 51; 54; 55; 57; 59; 62–66; 68; 70; 71; 73; 75; 79; 81; 82; 2195; 3681; 3705; 3712; 3765; 3799; 3803; 3822; 3829; 3834; 3867; 3878; 3901; 3912; 3927; 3981; 4010; 4011; 4037; 4190; 4588; 4664; 4673; 4756; 4806; 4926; 4952; 5030; 5120; 5129; 5134; 5155; 5180; 5185; 5190; 5208; 5209; 5219; 5223; 5226; 5227; 5229; 5231–5233; 5240; 5246; 5262; 5263; 5299; 5301; 5309; 5319; 5320; 5338; 5340–5342; 5348; 5349; 5358; 5381; 5386; 5387; 5397; 5410; 5411; 5415; 5423; 5424; 5437; 5489; 5601; 5647; 5651; Iloilo Straits, Philippine Islands; Fiji Islands. This species is also widely distributed in the *Carnegie*, Monaco, and *Siboga* panktons.

Genus PARAUGAPTILUS Wolfenden, 1904

PARAUGAPTILUS BUCHANI Wolfenden

PLATE 26, FIGURES 382, 383

Paraugaptilus buchani WOLFENDEN, Journ. Mar. Biol. Assoc. United Kingdom, new ser., vol. 7, No. 1, p. 123, pl. 9, figs. 44, 45, 1904.

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Stations 4761; 5231. Originally established by Wolfenden upon specimens from the northern Atlantic and briefly characterized. Sars gave a detailed description and figures of both sexes in the Monaco report, but it is not found in the other planktons. This is the first record from the Pacific.

A male and a female were found at station 4761 in the northern Pacific, and another pair found at station 5231 in the Philippines. The fifth legs of these two *Albatross* females differ from the others and from the ones described by Sars. They are asymmetrical, the right leg larger than the left; in the first one (fig. 382) the marginal seta on the left leg is removed a little from the edge on to the surface of the leg. There is also a small knob or process on the surface of each leg just behind the base of the terminal seta. In the second one these knobs are lacking, but there is an extra spine on the right leg behind the terminal seta. In all other details these females correspond exactly with the description and figures given by Sars. The differences noted therefore must be regarded as malformations rather than specific characters.

Genus PAREUCHAETA A. Scott, 1909

[?] PAREUCHAETA BARBATA (Brady)

Euchaeta barbata Brady, Voyage of H. M. S. *Challenger*, Zool., vol. 8, pt. 23, Copepoda, p. 66, pl. 22, figs. 6–12, 1883.

Stations 4646; 4648; 4650; 4660; 4661; 4663–4665; 4667; 4669; 4671; 4676; 4679; 4681; 4700; 4707; 4711; 4715; 4719; 4721; 4722; 4757; 4765; 5185. Identified by Sars from 20 of these *Albatross* stations and from 41 Monaco stations; found also at one *Challenger* and one *Siboga* station. The genital segment of the female carries a small rounded tubercle on the left side at the base of the ventral protuberance. [The identity of *P. barbata* has long been questionable. It is unfortunate that Dr. Wilson was not aware of Sewell's discussion (1929, p. 155) of this matter and his description of a specimen that he had compared with Brady's type in the British Museum. A careful study of these *Albatross* specimens will have to be made before the actual identification can be stated.—M. S. W.]

PAREUCHAETA BISINUATA (Sars)

Euchaeta bisinuata Sars, Bull. Inst. Océanogr. Monaco, No. 101, p. 12, 1907.
Pareuchaeta bisinuata Sars, Rés. camp. sci. Albert de Monaco, No. 69, p. 123, pl. 33, figs. 16–22, 1925.

Stations 4765; 5263; 5633. This species was found at 16 Monaco and 5 *Siboga* stations and was fully described by Sars in the Monaco report. Most of the *Albatross* specimens, as well as those in the *Siboga* plankton, were captured in vertical hauls from considerable depths.

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PAREUCHAETA BRADYI (With)

Euchaete bradyi With, Danish Ingolf-Expedition, vol. 3, pt. 4, p. 182, figs. 53a–b, pl. 6, fig. 9a, 1915.

Stations 4724; 5120; 5231. Established by With upon a single female from the northern Atlantic north of the British Islands and recorded by Sars in the Monaco plankton, the locality unknown. All the *Albatross* specimens came from the tropical Pacific and are the first record from that ocean. It is evidently a rare species and not at all well distributed, and the male still remains unknown.

PAREUCHAETA CALIFORNICA (Esterly)

Plate 26, Figures 384–389

Euchaeta californica Esterly, Univ. California Publ. Zool., vol. 3, No. 5, p. 60, pl. 9, fig. 11; pl. 10, figs. 26, 34, 1906.

Stations 4588; 4700. Established in 1906 by Esterly upon a single female taken off the coast of southern California. Scott recorded 10 females in the *Siboga* plankton from the tropical Pacific, Sewell found it in the Indian Ocean (1929, p. 158) but it does not appear in the other lists. Neither Esterly nor Scott gave more than a brief description, and both left the male unknown. About 40 specimens, including both sexes, were obtained from these two *Albatross* stations and are here described, the male for the first time. This male and a female have been given U.S.N.M. No. 74127.

Female.—Metasome elongate elliptical, two and a half times as long as wide; head separated from the first segment and broadly rounded in front with a central projection over the base of the rostrum. Fourth and fifth segments fused and narrowly rounded posteriorly, with a tuft of coarse hairs at the tip of the curve. Urosome two-fifths as long and a fourth as wide as the metasome and 4-segmented. Genital segment barrel-shaped in dorsal view, considerably enlarged through the center with a large ventral protuberance nearer the forward end. On each side of the genital opening is a fingerlike process starting at the anterior margin and extending backward into plain view behind the ventral protuberance. The one on the left is a little longer than the one on the right, and the two are inclined somewhat toward each other. The first two abdominal segments are the same length, each a little shorter than the genital segment. The anal segment is much shorter and incised at the center of its posterior margin. The caudal rami are well separated, a little longer than wide, with the outer seta at the center of the outer margin.

The first antennae reach the center of the first abdominal segment and are rather slender, with three or four long setae on the basal half and three at the very tip. There are also small cylindrical aesthetasks

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on segments 5, 8, 11, 13, 18, and 23. In the second antennae the exopod is much longer than the endopod and the end segment is longer than the second segment. The mandible (fig. 387) has two large acute teeth on the narrow chewing blade, the outer one longer than the inner. The palp is biramose, the rami well separated, the endopod 2-segmented, the exopod 4-segmented. The maxilliped is 7-segmented, the basal segment with three setae on the outer margin, the second segment with three setae on the inner margin, and the five end segments very short, each with two large setae on its inner margin, curved and plumed on the concave side only. The exopod of the first leg is distinctly 3-segmented; Esterly said it was 2-segmented with an extra spine on the basal segment; Scott did not mention it, but his figure shows three segments. Total length 7 mm.

Male.—Metasome similar to that of the female but proportionally shorter and wider; head separated from the first segment with the rostrum turned ventrally almost at right angles to the body axis. Fourth and fifth segments fused with a similar tuft of hairs at the tip of the curve. Urosome longer than in the female, half as long as the metasome if the caudal rami are included and made up of five segments. These diminish in length distally, but the first four are about the same width; the anal segment is much shorter and narrower. The caudal rami are longer than the anal segment and one-half longer than wide.

The first antennae are shorter than in the female and do not quite reach the urosome, and neither of them is geniculate. The second antennae and mouth parts correspond to those of the female with similar mandibles and maxillipeds. The exopod of the first leg is also distinctly 3-segmented. The fifth legs are large and reach beyond the tips of the caudal rami (fig. 385). The second basipod of the right leg is considerably swollen, and the exopod is 2-segmented, the end segment as long as the basal and bluntly rounded at its tip. The endopod is 1-segmented and as long as the basal exopod segment; the distal half is flattened and somewhat twisted. The left leg is 4-segmented and made up of two basipod and two exopod segments with no trace of an endopod. Neither basipod segment is swollen, but the first exopod segment is enlarged on its inner margin. The end segment is widened at its tip and the terminal armature is rather complicated, as seen in enlarged detail in figure 389. Total length 6.75 to 7 mm.

Allotype male.—U.S.N.M. No. 74127; station 4588, latitude 19°52′ N., longitude 106°02′ W., southwest coast of Mexico.

Remarks.—The fingerlike processes on the ventral protuberance of the genital segment in the female are plainly visible in lateral and

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ventral view. Combined with the detailed armature at the tip of the left leg in the male they furnish the best characteristics for identification.

PAREUCHAETA EREBI Farran

PLATE 14, FIGURES 173–179

Pareuchaeta erebi FARRAN, British Antarctic (*Terra Nova*) Exped., 1910, Zool., vol. 8, No. 3, p. 239, fig. 9, 1929.

Stations 41; 2861; 3901; 4700; 5030; 5129; 5227. Fifteen specimens, including both sexes, were taken in a tow at a depth of 300 fathoms at station 5030 in the Okhotsk Sea. These *Albatross* specimens are smaller than those described by Farran and differ in one or two minor details, but they agree in all essential characteristics and include males as well as females.

Female.—Metasome elliptical, a little more than a third as wide as long; head fused with the first segment and tapered to an acute point anteriorly. Fourth and fifth segments also fused, the posterior corners reaching the genital segment each tipped with a short blunt spine. Urosome not quite half as long as the metasome, tapering a little posteriorly and 4-segmented. In lateral view the base of the ventral protuberance of the genital segment extends the whole length of the segment, with the protuberance itself close to the anterior margin. At the tip the protuberance is flanked by a lamella on each side; the one on the right is larger than the one on the left and extends considerably farther posteriorly and ventrally, forming the projecting tip seen in side view. Between the bases of these two lamellae anteriorly is a third lamella, almost an exact trefoil in shape, and posteriorly is a roughened ridge. The first two abdominal segments are about equal in length; the anal segment is less than a fourth as long. The caudal rami are twice as long as wide, and the appendicular setae are weakly geniculate.

The first antennae reach the anterior margin of the fourth thoracic segment and are rather sparsely setose. The exopod of the second antenna is much longer than the endopod, and the end segment is longer than the second segment. The exopod of the first leg is 2-segmented, the basal segment with a very concave outer margin armed with an aciculate spine at the center of the concavity and a large acuminate spine at the outer distal corner. The endopod is 1-segmented with five setae and does not reach the end of the basal segment of the exopod. Total length 7 to 7.50 mm.

Male.—General body shape and proportions like those of the female but rostrum not so prominent and posterior corners of the metasome evenly rounded without spines. Urosome more than half as long as

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the metasome and not tapered, the genital segment completely symmetrical.

First antennae reaching the genital segment and more setose than in the female. The second antennae and mouth parts similar to those of the female, but the exopod of the first leg is distinctly 3-segmented. The basal segment, however, has no outer spine or inner seta, and the spine at the outer distal corner of the second segment is much smaller than in the female. The second basipod of the right fifth leg is swollen to twice the diameter of the first; the endopod is the same length as the proximal segment of the exopod. The terminal segment of the exopod is fully as long as the basal and quite slender, with a blunt point. The two basipod segments of the left leg are cylindrical and reach the center of the right endopod. The left endopod is reduced to a slender spine so small as to be easily overlooked. The basal segment of the exopod is one-half longer than the end segment, and the latter is a little wider at the tip than at the base. Its complicated terminal armature is shown under greater magnification in figure 179, and attention is called to the three processes at the distal end and the dentate knob and margin on the inner side. Total length 7 to 7.25 mm.

Allotype male.—U.S.N.M. No. 70740; station 5030; latitude 46°29′30″ N., longitude 145°46′ E., Okhotsk Sea.

Remarks.—The distinctive characters in this species are the ventral protuberance on the genital segment of the female and the detailed armature of the end segment of the left fifth leg in the male.

PAREUCHAETA EXIGUA (Wolfenden)

PLATE 26, FIGURES 390–392

Euchaeta exigua WOLFENDEN, Deutsche Südpolar-Exped., 1901–1903, vol. 12, Zool., vol. 4, fasc. 4, p. 300, fig. 52a–d, 1911.

Station 4701. A single female of this species was identified by Sars in the plankton of this station between Easter Island and the Galápagos group. The species does not appear in any of the plankton lists, and the present record is the first since its original discovery, as well as the first for the Pacific Ocean. Station 4701 is one of the deeper tows from 300 fathoms to the surface, suggesting a possible reason for the scarcity of the species nearer the surface. Sars made a dorsal drawing of the entire body and also a profile drawing of the genital segment, which are here reproduced. The profile drawing corresponds closely with Wolfenden's figure, while the dorsal view is the first full length figure of the species to be published. On the tip of the ventral protuberance of the genital segment in the female are two pads (fig. 392). One of these is anterior in the center and extends backward; the other is on the right side and extends across to the left and

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away from the surface of the protuberance. It is the latter pad that forms the protrusion seen in the lateral view and thus furnishes a ready means of identification.

PAREUCHAETA GRACILIS (Sars)

PLATE 26, FIGURE 393

Euchaeta gracilis SARS, Bull. Mus. Océanogr. Monaco, No. 26, p. 16, 1905a.
Pareuchaeta gracilis SARS, Rés. camp. sci. Albert de Monaco, No. 69, p. 120, pl. 33, figs. 1–8, 1925.

Stations 42; 2859; 3799; 4709; 4759; 4760; 5129; 5185; 5227; 5231; 5263; 5319; 5320; 5553; 5578; Sabtán Island, Philippine Islands. Identified by Sars from three of these *Albatross* stations and from 13 Monaco stations. Both sexes were fully described in the Monaco report. It does not occur in any of the other plankton lists.

PAREUCHAETA GRANDIREMIS (Giesbrecht)

PLATE 15, FIGURES 180–185

Euchaeta grandiremis GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 4, sem. 2, p. 337, 1888; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 246, 264, pl. 16, figs. 11, 42; pl. 37, figs. 41, 42, 1892.

Stations 15; 16; 4583; 4585; 4634; 4637; 4638; 4646; 4648; 4652; 4659; 4663; 4664; 4665; 4667; 4673; 4676; 4679; 4681; 4687; 4700; 4701; 4707; 4711; 4713; 4715; 4717; 4719; 4721; 4722. Originally reported from the tropical Pacific, this species was next recorded from the tropical Atlantic in the *Carnegie* plankton. Giesbrecht's types were females but these *Albatross* specimens include both sexes. Since the only description of the female is very meager, it is redescribed here, along with a first description of the male. Both are based upon reproductions of Sars' excellent pencil drawings.

Female.—Metasome elliptical, three times as long as wide and narrowed but little at each end, the frontal margin sharply pointed and the rostrum almost at right angles to the body axis. The posterior corners of the thorax are smoothly rounded, with a few scattered hairs. Urosome two-fifths as long as the metasome and 4-segmented; the genital segment is a little wider than the abdomen and twice as long as wide, the lateral margins somewhat convex. The ventral protuberance is smoothly rounded and projects a distance equal to the thickness of the segment itself. The basal segment of the abdomen is longer than the other two segments combined, while the anal segment is very short. The caudal rami are longer than the anal segment and somewhat divergent; the appendicular setae are strongly geniculate and much lengthened. The ventral surface of the abdomen is somewhat hairy as seen in the lateral view.

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The first antennae reach five or six segments beyond the caudal rami and are rather sparsely setose. The endopod of the second antenna is longer and stouter than the exopod. The endopods of the first and second legs are 1-segmented, those of the second pair giving evidence that they are made of up two fused segments. Exopods of first legs 2-segmented; all the other leg rami 3-segmented. Total length 5 mm. Metasome 3.54 mm. long, 1.20 mm. wide.

Male.—Metasome similar to that of the female but proportionally shorter; forehead without a notch above the conical rostrum. Urosome nearly half as long as the metasome and 5-segmented; anal segment very short; appendicular setae very long and strongly geniculate.

Antennae, mouth parts, and first four pairs of legs like those of the female; fifth legs of a peculiar pattern. The two basipods of the right fifth leg are the same width and only moderately inflated. The endopod is a trifle longer than the basal segment of the exopod and bluntly pointed. Both segments of the exopod are curved a little, the basal segment longer than the terminal. The two basipods of the left leg reach the center of the basal segment of the right exopod; the left endopod is entirely lacking. The terminal armature of the left exopod is shown in magnified detail in figure 185. The teeth on the inner margin of the rigid ramus, the tuft of hairs on the inner margin of the movable ramus, and the spherical swelling tipped with hairs at the base between the two rami are distinctive characters. Total length 4.10 mm. Metasome 3.25 mm. long, 0.81 mm. wide.

Allotype male.—U.S.N.M. No. 70731; station 4667, latitude 12°00′ S., longitude 83°40′ W., off Peru.

Remarks.—The exceptional length of the first antennae combined with the size and shape of the ventral protuberance on the genital segment will serve to identify the female. The details of the end segment of the left fifth leg will do the same for the male. A depth of 1,000 to 1,800 meters is recorded by Giesbrecht for the vertical tows containing the original types; one of the *Albatross* tows was a vertical one from 2,000 fathoms to the surface, one from 400 fathoms, 20 from 300 fathoms, another was a tow of 2 fathoms below the surface, three were made at the surface, and at three stations surface captures were effected with the aid of an electric-light lure.

PAREUCHAETA HANSENII (With)

Euchaete hansenii WITH, Danish Ingolf-Expedition, vol. 3, pt. 4, p. 181, figs. 52a–b, 1915.

Stations 16; 4538; 4759; 5120; 5185; H. 3789. Originally established by With upon a single mutilated female from the northern Atlantic, it was obtained at three stations in the Monaco plankton and the female was fully described and figured by Sars.

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PAREUCHAETA INCISA (Sars)

Euchaeta incisa SARS, Bull. Océanogr. Monaco, No. 26, p. 17, 1905a.
Pareuchaeta incisa SARS, Rés. camp. sci. Albert de Monaco, No. 69, p. 117, pl. 32, figs. 7–11, 1925.

Stations 77; 3829; 4009; 4427; 4681; 5129; 5224; 5229; 5231; 5233; 5263; 5287; 5319; 5578. Identified by Sars from one of these *Albatross* stations and from six Monaco stations and fully described in the Monaco report. It was first reported from the Pacific in the *Carnegie* plankton. As in the preceding species, the male remains unknown.

PAREUCHAETA NORVEGICA (Boeck)

Euchaeta norvegica BOECK, Forh. Vid. Selsk. Christiania, vol. 14, p. 40, 1872.

Stations 2195; 2219; 2236; 3716; 4758; 4760; 4765; 4793; 4806; 5231; 5578; H. 2700. Both sexes were described by Sars (1902, p. 38) in his Crustacea of Norway and placed in the genus *Euchaeta* but were afterward made types of the new genus *Pareuchaeta* by Scott in the *Siboga* plankton. It appears in none of the other plankton lists. This species is fairly common in the temperate Atlantic, and the first record from the Pacific is established here.

PAREUCHAETA RASA Farran

PLATE 15, FIGURES 186–188

Pareuchaeta rasa FARRAN, British Antarctic (*Terra Nova*) Exped., 1910, Zool., Crustacea, vol. 8, No. 3, p. 240, fig. 10, 1929.

Stations 4634; 4652. Farran's types were all females. The males are here described for the first time, as both sexes were obtained in the *Albatross* plankton.

Female.—Metasome rather regularly elliptical, two and a third times as long as wide; rostrum slender, accuminate, and inclined forward; posterior corners of fused fourth-fifth segment evenly rounded, with tufts of short hairs. Urosome a little more than a third as long as the metasome; genital segment symmetrical, with the ventral protuberance attached in front of the center. On each side of the genital opening is a lateral flap extending backward, the one on the left side slightly weaker than the one on the right, with no visible structures between them. The first two abdominal segments are about the same length, the anal segment less than half as long. Caudal rami twice as long as wide, the appendicular setae very long and strongly geniculate.

First antennae reaching the center of the genital segment; exopod of second antenna longer than endopod. Exopod of first leg 2-segmented, basal segment with a single outer spine and no trace of fusion. Endopod of second leg slender and as long as the two basal

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exopod segments combined. Terminal segment of second exopod with three outer spines, the middle twice the size of the others, the notch inside of its base considerably deeper than in Farran's figure. Total length 5.51 mm. Metasome 4.20 mm. long, 1.65 mm. wide.

Male.—Slightly smaller than the female but with similar proportions; the antennae, mouth parts, and first four pairs of legs also similar. The fifth legs show distinctive characters; the second basipod of the right leg is considerably swollen and one-half longer than wide. The endopod is slender and as long as the basal exopod segment; the terminal exopod segment is a fourth shorter than the basal segment and well curved. The second basipod of the left leg is cylindrical and reaches the center of the right endopod. The left endopod is almost a third as long as the proximal exopod segment and is enlarged at its tip. The terminal armature of the end segment of the exopod is shown in figure 188, with the three rami nearly as long as the segment itself. Total length 5.25 mm. Metasome 4 mm. long, 1.33 mm wide.

Allotype.—U.S.N.M. No. 67261 (without station data).

Remarks.—This species most resembles *sarsi* but is little more than half as large, and the details of the genital protuberance in the female and of the fifth legs in the male are quite different (cf. fig. 250).

PAREUCHAETA SARSI (Farran)

PLATE 19, FIGURE 250

Euchaeta sarsi FARRAN, Fisheries Ireland, Sci. Invest. for 1906, pt. 2, p. 41, pl. 3, figs. 15, 16, 1908.

Stations 4671; 4679; 4701; 4753; 4760; 4800; 5063; 5287. Identified by Sars from 4 of these *Albatross* stations and from five Monaco stations and obtained by Scott at one *Siboga* station.

PAREUCHAETA SCOTTI (Farran)

Euchaeta scotti FARRAN, Fisheries Ireland, Sci. Invest. for 1906, pt. 2, p. 42, pl. 3, figs. 11, 12, 1908.

Stations 4655; 5287. Identified by Sars from the first of these *Albatross* stations off the Peruvian coast and from four Monaco stations. As the latter were all in the northern Atlantic, these *Albatross* specimens constitute a first record from the Pacific.

PAREUCHAETA TONSA (Giesbrecht)

Euchaeta tonsa GIESBRECHT, Bull. Mus. Comp. Zool., vol. 25, No. 12, p. 251, pl. 4, figs. 9, 10, 1895.

Stations 2; 18; 76–78; 80; 2859; 4683; 4685; 4687; 4703; 4705; 4730; 4757; 5120; 5185; 5263; 5489. Identified by Sars at 9 of these *Alba-*

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tross stations and at 34 Monaco stations and found in the *Siboga* and *Carnegie* planktons.

PAREUCHAETA TUMIDULA (Sars)

Euchaeta tumidula Sars, Bull. Mus. Océanogr. Monaco, No. 26, p. 15, 1905a.
Pareuchaeta tumidula Sars, Rés. camp. sci. Albert de Monaco, No. 69, p. 119, pl. 32, figs. 15–20, 1925.

Stations 27; 4667; 4679; 5120; 5287; 5319. Identified by Sars at the first three *Albatross* and at five Monaco stations, and present in the *Carnegie* list.

Genus PAROITHONA Farran, 1908

PAROITHONA PARVULA Farran

Paroithona parvula Farran, Fisheries Ireland, Sci. Invest. for 1906, pt. 2, p. 89, pl. 10, figs. 1–13, 1908.

Stations 5382; 5437. Established by Farran upon females taken in deep water off the west coast of Ireland and described in Sars (1918, p. 208) Crustacea of Norway. Not found in any of the plankton lists. The male still remains unknown.

Genus PENNELLA Oken, 1815

PENNELLA sp.

Station 5287. A single copepodid larva of some species of *Pennella* was taken in the tow at this station in the China Sea. A similar larva appears in the *Challenger* plankton and was named *Hessella cylindricum* by Brady. It is not, however, a matured adult but only a larva, and it swims about in the plankton until it finds a host to which it attaches itself and develops into some species of the parasitic genus *Pennella*. The larva cannot yet be specifically differentiated.

Genus PHAËNNA Claus, 1863

PHAËNNA SPINIFERA Claus

Phaënna spinifera Claus, Die freilebenden Copepoden, p. 189, pl. 31, figs. 1–7, 1863.

Stations 13; 16; 39; 48; 52; 54; 59; 65; 71; 75; 77; 3799; 3800; 3803; 3829; 3878; 3901; 3930; 3932; 3980; 4009; 4010; 4011; 4037; 4634; 4638; 4646; 4652; 4665; 4719; 4926; 5102; 5129; 5134; 5155; 5185; 5186; 5190; 5225; 5229; 5231; 5233; 5240; 5246; 5263; 5319; 5320; 5340; 5437; 5553; 5578; Fiji Islands; Charles Island, Galápagos. Identified by Sars from eight of these *Albatross* stations and from nine Monaco stations, appearing also in all the *Siboga* and *Carnegie* planktons.

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Genus PHYLLOPUS Brady, 1883

PHYLLOPUS AEQUALIS Sars

PLATE 27, FIGURES 394–396

Phyllopus aequalis SARS, Bull. Inst. Océanogr. Monaco, No. 377, p. 20, 1920; Rés. camp. sci. Albert de Monaco, No. 69, p. 344, pl. 124, figs. 7–9, 1925.

Stations 5185; 5437. Established by Sars upon a single female taken in the Monaco plankton west of Gibraltar. Up to the present time no second specimen had appeared, and so the species is not found in any of the lists. Both sexes were captured at these *Albatross* stations and the male is here described for the first time.

Female.—The chief characteristics of the female are the wide and somewhat flattened frontal margin between the bases of the first antennae; the very short and perfectly symmetrical posterior corners of the metasome; the perfect symmetry of the genital segment, which is fully as wide as long, with convex lateral margins; and the shortness of the first antennae, which scarcely reach the anterior margin of the fourth segment. The segments of the fifth legs are comparatively elongate and narrow, and the setae on the first and third segments are exceptionally long. Total length 3 mm. Metasome 2.35 mm. long, 1 mm. wide.

Male.—Metasome elliptical, not narrowed so much posteriorly as in the female, the posterior corners slightly longer and symmetrical. Urosome 5-segmented, all the segments approximately the same length and width, the anal segment reentrant posteriorly. Caudal rami nearly twice as long as wide and divergent; each with five setae, the outer one near the center of the lateral margin, the second inner one thicker and much longer than the others.

The left antenna is geniculate, the terminal portion made up of three segments, which together with the five segments in front of the flexure are elongate, narrow, and somewhat flattened. None of them are armed with setae except the two at the tip of the terminal portion. The rest of the antenna is gradually widened toward the base, and the segments are very short and indistinct with two or three long setae and numerous short ones. The fifth legs are shown in figure 395 and are considerably different from those in other species. The endopod of the left foot is quite small and only subtriangular in shape. The proximal segment of the exopod has a long process at the outer distal corner tipped with a spine. The terminal segment is stout and elongate with a short terminal spine and a longer subterminal one, curved like a sickle. The right basipod carries the rudiment of an endopod and a 2-segmented exopod, whose end segment is considerably flattened and somewhat cochleate. Total length 2.90 mm. Metasome 2 mm. long, 1 mm. wide.

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Allotype male.—U.S.N.M. No. 74128; station 5185, latitude 10°05′45″ N., longitude 122°18′30″ E., between Panay and Negros.

Remarks.—In his description of the female Sars noted the similarity of the two species *aequalis* and *giesbrechti* but decided they were distinct species. As the *Albatross* plankton contained males of both these species, Sars' contention is proved to be correct.

PHYLLOPUS BIDENTATUS Brady

Phyllopus bidentatus BRADY, Voyage of H. M. S. *Challenger*, Zool., vol. 8, pt. 23, Copepoda, p. 78, pl. 5, figs. 7–16, 1883.

Stations 2; 26; 4609; 4663–4665; 4676; 4679; 4683; 4685; 4687; 4695; 4703; 4705; 4717; 4719; 4722; 4740; 5185. Identified by Sars at 18 of these 19 *Albatross* stations but not appearing in the Monaco plankton. Both sexes were found in the *Siboga* plankton and were described by Scott.

PHYLLOPUS GIESBRECHTI A. Scott

PLATE 27, FIGURES 397–399

Phyllopus giesbrechti A. SCOTT, Copepoda of the *Siboga*-Expedition, monogr. 29a, pt. 1, p. 149, pl. 46, figs. 1–6, 1909.

Station 5185. This species was established by A. Scott in the *Siboga* plankton upon three females from the Banda Sea. He considered them specifically distinct from *bidentatus* established by Brady in the *Challenger* report. As the species does not appear in any of the other lists, these *Albatross* specimens constitute the first record since the original discovery. Better than that, they include the male sex as well as the female and so permit the completion of the specific diagnosis, the male being described here for the first time.

Female.—Scott fully described and figured the female, citing the following distinguishing characters: The posterior corners of the metasome are practically symmetrical and do not reach the center of the genital segment. In a lateral view these corners are narrowly rounded and not pointed. The genital segment is longer than the first two abdominal segments combined and the caudal rami are twice as long as wide. Total length 2.80 mm.

Male.—Metasome elliptical, a little more than twice as long as wide and narrowed more posteriorly than anteriorly. Posterior corners symmetrical, the terminal spines curved inward, with a distinct sinus at the base on the inside, and overlapping the genital segment but little. Urosome 5-segmented, two-fifths as long as the metasome, and nearly uniform in width. Genital segment with parallel sides and a little longer than any of the other segments. First three abdominal seg-

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ments equal in length; anal segment slightly longer and widened distally. Caudal rami twice as long as wide and parallel, each with five setae, the outer one at the center of the outer margin.

First antennae as long as the metasome, the right one very slender, the left one stouter and geniculate, the terminal portion 3-segmented. Second antennae, mouth parts, and first four pairs of legs like those of the female, fifth legs distinctive. The left basipod carries a triangular endopod attached by its apex, the other two angles rounded. The proximal segment of the exopod projects outside the base of the distal segment and is tipped with a spine. The end segment is much swollen and tipped with a stout spine, and the accessory movable spine is long, slender, and nearly straight. The right leg has no endopod, and the distal segment of the exopod is flattened into a lamina bent nearly at right angles. The part beyond the bend is boot-shaped, as in *helgae*, but carries on the heel a stout process tipped with a minute spine. Total length 2.60 mm. Metasome 1.90 mm. long, 0.90 mm. wide.

Allotype.—U.S.N.M. No. 74129; station 5185, latitude 10°05′45″ N., longitude 122°18′30″ E., between Panay and Negros.

Remarks.—Station 5185, where these *Albatross* specimens were obtained, is between Panay and Negros Islands not far from the Banda Sea where Scott's types were obtained. Referring to the comparison of this species with *aequalis*, mentioned under the latter species, we have here two females enough alike to make their separation somewhat difficult and two males exhibiting enough dissimilarity to make their separation imperative. Evidently this is an instance where both sexes are necessary to make satisfactory specific diagnoses.

PHYLLOPUS HELGAE Farran

Phyllopus helgae FARRAN, Fisheries Ireland, Sci. Invest. for 1906, pt. 2, p. 83, pl. 9, figs. 5, 6, 1908.

Stations 5120; 5320. Farran's type specimens were obtained in the deep Atlantic off the west coast of Ireland. The species was found also in the Monaco, *Siboga*, and *Carnegie* planktons.

PHYLLOPUS IMPAR Farran

Phyllopus impar FARRAN, Fisheries Ireland, Sci. Invest. for 1906, pt. 2, p. 84, pl. 9, figs. 1-4, 1908.

Stations 4664; 5120. Established by Farran upon female specimens from the northern Atlantic, and afterward both sexes were described in the *Siboga* plankton and in the Monaco plankton. The Monaco specimens came from the northern Atlantic as did the types, but the *Siboga* specimens came from the Malay Archipelago in the Pacific.

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PHYLLOPUS MUTICUS Sars

PLATE 15, FIGURE 189

Phyllopus muticus SARS, Bull. Inst Océanogr. Monaco, No. 101, p. 26, 1907; Rés. camp. sci. Albert de Monaco, No. 69, p. 345, pl. 124, figs. 10–16, 1925.

Station 4687. Identified by Sars at this *Albatross* station between Callao, Peru, and Easter Island and at three Monaco stations but not found in the *Siboga* or *Carnegie* planktons.

Genus PLEUROMAMMA Giesbrecht, 1898

PLEUROMAMMA ABDOMINALIS (Lubbock)

Diaptomus abdominalis LUBBOCK, Trans. Ent. Soc. London, new ser., vol. 4, p. 28, pl. 10, figs. 1–8, 1856.

Stations 2; 27; 34; 49; 60; 65; 236; 2859; 3799; 3867; 3878; 3901; 4574; 4580; 4590; 4619; 4635; 4638; 4640; 4644; 4652; 4655; 4657; 4681; 4689; 4700; 4707; 4717; 4719; 4721; 4730; 4734; 4740; 4757; 4758; 4926; 4952; 5120; 5129; 5133; 5180; 5185; 5186; 5190; 5196; 5224; 5227; 5231; 5233; 5234; 5263; 5319; 5422; 5437; 5451. Identified by Sars from 22 of these *Albatross* and from 71 Monaco stations and present also in the *Challenger*, *Siboga*, and *Carnegie* planktons. The species is well distributed and under favorable conditions often congregates in large numbers.

PLEUROMAMMA BOREALIS (F. Dahl)

Pleuromma boreale F. DAHL, Zool. Anz., vol. 16, No. 415, p. 105, 1893.

Stations 19; 5263. Established by F. Dahl upon specimens from the northern Atlantic and not appearing in any of the plankton reports.

PLEUROMAMMA GRACILIS (Claus)

Pleuromma gracile CLAUS, Die freilebenden Copepoden, p. 197, pl. 5, figs. 7–11, 1863.

Stations 1; 3; 6–8; 11; 13; 14; 16; 18; 19; 21–25; 27; 33; 34; 36; 41; 42; 48; 63; 65–67; 77; 79; 2195; 3765; 3799; 3800; 3867; 3878; 3901; 4574; 4640; 4644; 4646; 4652; 4685; 4700; 4707–4710; 4719; 4722; 4728; 4730; 4757; 4760; 4766; 4793; 4806; 4926; 5110; 5120; 5125; 5129; 5180; 5185; 5186; 5190; 5196; 5223; 5224; 5227; 5229; 5231; 5233; 5234; 5240; 5246; 5263; 5422; 5424; 5434; 5437; 5451; Sabtán, Nasugbu Bay, and Luzón Island, Philippine Islands. Identified by Sars from 35 of these *Albatross* stations and from 39 Monaco stations; also present in the *Siboga* and *Carnegie* planktons.

PLEUROMAMMA PISEKI Farran

PLATE 27, FIGURES 400, 401

Pleuromamma piseki FARRAN, British Antarctic (*Terra Nova*) Exped., 1910, Zool., vol. 8, No. 3, p. 261, figs. 23, 24, 1929.

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Stations 3799; 3878; 4644; 5110; 5185; 5196; 5227; 5229; 5234; 5246; 5263; 5320; Nasugbu Bay and Luzón Island, Philippine Islands. Established by Farran upon specimens from the north temperate and tropical Atlantic and not found in any of the plankton lists. In Steuer's revision of the genus *Pleuromamma* (1932, p. 34), *P. piseki* is not admitted as a separate species but is made a variety of *gracilis*. However, the genital segment is indented on the left side, there is a large pigmented area around the genital pore, and the fifth legs show differences in both sexes.

PLEUROMAMMA QUADRUNGULATA (F. Dahl)

Pleuromma quadrungulatum F. Dahl, Zool. Anz., vol. 16 (1894), No. 415, p. 105, 1893.

Stations 4760; 5246; 5263; 5437. Established upon specimens from the tropical Atlantic and appearing in the *Carnegie* plankton.

PLEUROMAMMA ROBUSTA (F. Dahl)

Pleuromma robustum F. Dahl, Zool. Anz., vol. 16 (1894), No. 415, p. 105, 1893.

Stations 18; 63; 2195; 3799; 4574; 4583; 4585; 4587; 4594; 4598; 4627; 4652; 4681; 4700; 4705; 4717; 4719; 4785; 5120; 5129; 5185; 5186; 5196; 5231; 5233; 5246; 5320; 5437. Identified by Sars from 9 of these *Albatross* stations and 22 Monaco stations, and present in the *Carnegie* list.

PLEUROMAMMA XIPHIAS (Giesbrecht)

Pleuromma xiphias Giesbrecht, Atti Accad. Lincei, Rome, ser. 4, vol. 5, sem. 2, p. 25, 1889; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 347, 357, pl. 32, fig. 14; pl. 33, figs. 42, 45, 50, 1892.

Stations 1; 2; 18; 60; 222; 3712; 3799; 3800; 3878; 4611; 4619; 4637; 4681; 4685; 4687; 4689; 4691; 4695; 4700; 4703; 4705; 4707; 4709; 4715; 4717; 4719; 4721; 4722; 4724; 4730; 4732; 4734; 4740; 4742; 4743; 4746; 4757; 4766; 4926; 4952; 5063; 5120; 5125; 5129; 5155; 5179; 5180; 5185; 5186; 5190; 5196; 5223; 5224; 5227–5229; 5231; 5233; 5246; 5263; 5287; 5320; 5422; 5437; 5451; 5633; Sabtán Island, Philippine Islands. Identified by Sars at 30 of these *Albatross* stations and at 64 Monaco stations; also found in the *Siboga* and *Carnegie* planktons.

Genus PONTELLA Dana, 1846

PONTELLA ATLANTICA (Milne Edwards)

Plate 15, Figures 190–191; Plate 19, Figure 249

Pontia atlantica Milne Edwards, Hist. Nat. Crust., vol. 3, p. 420, pl. 39, 1840.

Stations 139; 3807; 3822; 3864; 3908; 3981; 4010; 4190; 4574; 4588; 4611; 4615; 4617; 4640; 4667; 4680; 4692; 4731; 4952; 5223. Identified by Sars from six of these *Albatross* stations and from nine Monaco sta-

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tions; also found in the *Carnegie* plankton. The urosome is very asymmetrical in the female and covered with dorsal plates twisted to the right and ending in long acuminate spines on the right side. The spine on the right posterior corner of the metasome is very broad and bifid at its tip.

PONTELLA CERAMI A. Scott

PLATE 27, FIGURES 402, 403

Pontella cerami A. SCOTT, Copepoda of the *Siboga*-Expedition, monogr. 29a, pt. 1, p. 163, pl. 53, figs. 8–15, 1909.

Caldera Bay anchorage, west coast of Mindanao, Philippine Islands. Established by Scott upon two males taken in the Banda Sea in a vertical haul from 1,900 meters to the surface. At this anchorage in the Sulu Sea the net was set at the surface in the tidal current.

Male.—Head narrowed to a blunt point over the rostrum and armed with lateral hooks; fifth segment well separated from the fourth, with spines at the posterior corners that nearly reach the distal margin of the genital segment. The genital segment is dilated at its posterior end, and the second abdominal segment is longer than the third and fourth combined. The caudal rami are also as long as these last two abdominal segments together. In the right fifth leg the hand of the chela is rather slender but strongly muscled; the thumb is long and slender and curved inward; the movable finger is stout and more strongly curved inward than the thumb. At the center of the inner margin of the hand is a short process terminating in a lanceolate spine, with a slender spine at its base on the side next to the thumb. The end segment of the left leg is tipped with three spines and has a pad along its inner margin fringed with hairs.

Remarks.—As the female of this species is still unknown, it is of course possible that these specimens may ultimately prove to be the males of some species now founded upon females alone. Until that can be proved, however, Scott's species remains valid.

PONTELLA CHIERCHIAE Giesbrecht

PLATE 28, FIGURES 408, 409

Pontella chierchiae GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 5, sem. 2, p. 28, 1889; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 462, 478, pl. 24, figs. 12, 27, 38; pl. 40, figs. 19, 22, 26, 35, 1892.

Stations 4607; 5223; 5226. Giesbrecht's type specimens came from the vicinity of Hong Kong, and these are the first to be reported since the original discovery. *Albatross* stations 5223 and 5226 are just west of Luzón in the China Sea, very near the type locality. The fact that this species does not appear in any of the plankton lists and that the

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two localities where it has been found are so close together suggests that it is very limited in its distribution. As can be seen in the figure the fifth legs of the female have more spines than usual upon the exopods, while the endopods are conical and unarmed. In the right leg of the male the thumb is long and slender, while the movable finger is stout, enlarged both at its tip and at its base and between the two enlargements is very sharply bent. The hand of the chela has a single projection on its inner margin tipped with a short spine.

PONTELLA DANAE Giesbrecht

PLATE 16, FIGURES 195–197

Pontella danae GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 5, sem. 2, p. 28, 1889; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 461, 477, pl. 24, figs. 32, 33, 35, 40; pl. 40, figs. 16, 20, 1892.

Stations 9; 27; 30; 31; 236; 3412; 3683; 3912; 4592; 4611; 4615; 4619; 4635; 4640; 4650; 4659; 4685; 4714; 4716; 4741; 4952; 5319; H. 3786. Identified by Sars from 15 of these *Albatross* stations; not found in the Monaco plankton; present at only a single station in the *Siboga* plankton and at two stations in the *Carnegie* plankton. It can be easily recognized by the great dissimilarity in the caudal rami, the right one being four times as large as the left.

PONTELLA DENTICAUDA A. Scott

Pontella denticauda A. SCOTT, Copepoda of the *Siboga*-Expedition, monogr. 29a, pt. 1, p. 161, pl. 52, figs. 1–12, 1909.

A single female was found at Caldera Bay anchorage, west coast of Mindanao, Philippine Islands. Scott had 50 specimens, including both sexes, from the tropical Pacific a little south of the Philippines. Not found in any of the other plankton lists.

PONTELLA DIAGONALIS, new species

PLATE 28, FIGURES 410–413

Station 5553. A single female was captured at the surface at this station off Jolo Island in the Philippines.

Female.—Metasome elliptical, two and a half times as long as wide; base of the rostrum projecting as a rounded knob from the center of the forehead; lateral hooks stout and strongly curved. Posterior end of metasome squarely truncated, with a large triangular spine at each corner. These spines are symmetrical, with a wide flange on the inside at the base, are acutely pointed, and reach to the posterior margin of the genital segment. The fifth segment is very short and imperfectly separated from the fourth. On the midline of the dorsal surface is a longitudinal row of dark circular spots, one at the posterior margin of each of the first four thoracic segments. The anterior one is the

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largest, and they diminish in size backward, the last one being scarcely larger than an ordinary period mark (compare with *Pontella meadii*, fig. 417).

Urosome one-third as long as the metasome and extremely asymmetrical. The genital segment is covered by a dorsal carapace, which projects backward over the abdomen and the left caudal ramus. This carapace is raised into a dorsal knob at the right posterior corner of the genital segment, and is produced into a stout curved spine in front of the outer margin of the right caudal ramus. The left side of the carapace is raised into a smaller knob at the left posterior corner of the genital segment, and is then produced diagonally backward into a spatulate process covering the abdomen and most of the left caudal ramus. This carapace is in contact with the dorsal surface of the genital segment but is raised above the abdomen and caudal ramus. The abdomen is 1-segmented and almost entirely concealed in dorsal view. The caudal rami are very unequal, the right one nearly twice as large as the left and pointed at the tip. Each carries five setae, three on the outer margin, one on the inner margin, and one terminal.

The first antennae reach only to the center of the third thoracic segment and are rather slender. The fifth legs are exceptionally long, reaching to the tips of the caudal rami but are slender. The exopod is four times as long as the endopod and curved inward, with three small spines on the outer margin and a large acuminate terminal spine. The endopod is bifurcate at its tip for more than a third of its length. Total length 4 mm. Metasome 3.15 mm. long, 1.30 mm. wide.

Type.—U.S.N.M. No. 74130; station 5553, latitude 5°51′ N., longitude 120°46′30″ E., off Jolo, Philippine Islands.

Remarks.—The urosome shows a marked diagonal asymmetry to the left, whence the specific name. The rostrum has a large outer and inner eye, and the fifth legs are exceptionally long for a copepod of this size.

PONTELLA FERA Dana

PLATE 28, FIGURE 414

Pontella fera DANA, Proc. Amer. Acad. Arts and Sci., vol. 2, p. 34, 1849; United States Exploring Expedition, 1838–1842 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1169, 1853; pl. 82, fig. 5 a–1, 1855.

Stations 173; 236; 3878; 4011; 5223; 5240; 5246; 5299; 5415; 5601. Established by Dana upon specimens from north of the Samoan Islands and appearing only in the *Siboga* plankton list. It has been reported, however, from the tropical Pacific and Indian Oceans by Wolfenden (1905a, p. 1021) and Sewell (1914, p. 237; 1932, p. 377). Dana's female specimens belong to this species, but the male whose fifth leg is shown on Dana's plate 82, fig. 5, *1*, is the male of *tenuiremis*

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and not of *fera.* The fifth legs of a *fera* male are seen in figure 414 and may be identified by the three fingerlike processes on the hand of the chela of the right leg. One of these is near the base of the movable finger, and the other two are at the opposite end of the hand, and when the chela is closed the finger shuts down between them. These last two are unequal in length; the longer one is blunt at its tip and transversely wrinkled, the shorter one smooth and acute. Behind these two processes on what might be termed the wrist of the hand is a circular lamina projecting outward and sidewise.

PONTELLA GRACILIS, new species

PLATE 27, FIGURES 404–407

Station 5223. Five females were found in the plankton at this station between the islands of Luzón and Marinduque in the Philippines in a surface tow.

Female.—Metasome elongate elliptical, three and a half times as long as wide and narrowed but very little at each end. Head conically rounded in front, with well-defined lateral hooks; rostrum very large for so small a copepod and bifurcate to the very base, the branches acuminate. Fourth and fifth segments fused, the posterior corners bluntly rounded and reaching the center of the genital segment. Urosome half as wide and, without the caudal rami, less than a third as long as the metasome and 3-segmented. The anal segment is the longest and the middle segment the shortest, and all three are about the same width. The caudal rami are twice as long as wide but are much shorter than the anal segment, and are somewhat divergent.

The first antennae do not quite reach the urosome and are rather slender and sparsely setose. The endopod of the second antenna is 3-segmented, and the exopod just reaches its tip. The fifth legs are unlike those of other species in the genus; the two basipod segments are much swollen, the second one diagonally cut at the inner corner for the attachment of the endopod. The latter is conical, half as long as the exopod, and bluntly rounded at its tip without bifurcation. The exopod is twice the width of the endopod at its base and is narrowed distally and obliquely truncated at its tip, with a short acute spine at each corner. Total length 2 mm. Metasome 1.70 mm. long.

Types.—U.S.N.M. No. 74131; station 5223, latitude 13°36′ N., longitude 121°25′30″ E., off Santa Cruz, Philippine Islands.

Remarks.—This species may be recognized by its minute size, its short first antennae, and the details of the fifth legs.

PONTELLA LOBIANCOI (Canu)

PLATE 28, FIGURES 415–416

Pontellina lobiancoi CANU, Bull. Sci. France et Belgique, vol. 19, p. 101, pl. 8, figs. 7, 8; pl. 9, 1888.

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Stations 14; 2396; 4615; 4692; 4952. Identified by Sars from three of these *Albatross* stations and one Monaco station and otherwise present only in the *Carnegie* plankton. Both sexes were briefly described and excellently figured by A. Scott (1906, p. 50). Figures of the fifth legs in both sexes by means of which the species can be easily identified are here reproduced.

PONTELLA MEADII Wheeler

PLATE 28, FIGURES 417–419

Pontella meadii WHEELER, Bull. U. S. Fish Comm., vol. 19 (for 1899), p. 180, fig. 17, 1901.

Station 2396. A single female was obtained from this station in the Gulf of Mexico. Originally established by Wheeler upon specimens obtained in Woods Hole Harbor, it has been found also in Chesapeake Bay. When alive or freshly preserved there is a row of dark blotches, one on each segment, along the dorsal midline of the metasome. These, in connection with the shortness of the urosome, will ordinarily identify the species. However, the characteristic spots slowly fade away in preserved material. The details of the fifth legs in both sexes must then be called upon to furnish the specific characters, especially the right fifth leg of the male, as seen in figure 419. In United States National Museum Bulletin 158 (Wilson, 1932, p. 154) it was said: "This seems to be a southern form that appears within the present area [Woods Hole] during the summer." The discovery of the species in Chesapeake Bay and now in the Gulf of Mexico supports such a suggestion.

PONTELLA PRINCEPS Dana

Pontella princeps DANA, Proc. Amer. Acad. Arts and Sci., vol. 2, p. 34, 1849; United States Exploring Expedition, 1838–1842 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1168, 1853; pl. 82, fig. 4 a–c, 1855.

Stations 3927; 4190. Originally established by Dana in the Wilkes plankton upon specimens from the tropical Pacific southwest of Tongatabu; later recorded in the *Siboga* and *Carnegie* plankton.

PONTELLA PULVINATA, new species

PLATE 16, FIGURES 198–204; PLATE 19, FIGURE 245; PLATE 35, FIGURE 532

Sixty specimens, including both sexes, were captured in a surface tow off Robben Island in the Okhotsk Sea at an unnumbered station.

Female.—Metasome elliptical, three times as long as wide, strongly narrowed anteriorly; head bordered on each side by a wide membrane carrying a lateral hook. The fourth and fifth segments are fused, and the posterior corners are produced into thick fleshy triangular pads, suggesting the specific name. These pads are assymetrical, the

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one on the right wider and longer than the one on the left, nearly reaching the posterior margin of the genital segment. The posterior ends of the pads are broadly rounded with a minute spine at the very tip, which is easily overlooked.

The urosome is 3-segmented and very asymmetrical; the dorsal surface of the genital segment is produced to the left and backward into a curved spine, which nearly reaches the tip of the caudal ramus. On the right side of the segment and nearer the posterior margin is a short blunt process curved over ventrally, and usually concealed in dorsal view by the right pad at the corner of the thorax. This pad and the genital segment were separated under pressure, bringing this process into view dorsally, as in figure 532. On the left side is a rounded process projecting to the left and covered in dorsal view by the left pad at the corner of the metasome. Both pads were removed for the drawing in figure 245. The basal abdominal segment is much larger than the anal segment, with an angular process at the center of the right side and a rounded process at the anterior corner of the left side. The anal segment is about half as long and wide as the basal segment, and its dorsal surface is produced backward over the bases of the caudal rami in a 3–lobed process which reaches the center of the rami. The latter are longer than wide and the left one is a little larger than the right.

The first antennae reach the center of the last thoracic segment and are very slender but moderately setose. The exopod of the second antenna is a little shorter than the endopod and considerably narrower. The chewing blade of the mandible has a long conical tooth at the outer corner, then a shorter spherical tooth tipped with a spine, followed by three triangular teeth, the first two bifid at the tip. The palp has an exceptionally long basal portion and two short rami, each made up of a single segment. The endopod of the first leg is 3-segmented, of the second, third and fourth legs 2-segmented. The fifth legs are slender, the exopods twice as long as the endopods and each ramus 1-segmented. The endopods are bifurcate at their tips, the inner branch longer than the outer. Each exopod has three spines at its tip, the middle one the longest, and a small spine on the outer margin near the center. Total length 3.75 mm. Metasome, excluding pads, 3 mm. long, 1.12 mm. wide.

Male.—Metasome proportionally narrower than in the female; head with similar flanges on each side armed with lateral hooks. Posterior corners of the last thoracic segment very asymmetrical, on the left side a pad similar to those in the female, on the right side a long and slender spine reaching back to the center of the antepenultimate segment of the abdomen. The genital segment is considerably enlarged and is produced outward on the right side at the posterior corner into a short process cleft at its tip. The abdomen is 4-segmented and nar-

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rower than the genital segment, the first two segments of the same length, the third one three-fifths, the anal segment two-fifths as long. The caudal rami are twice as long as wide and symmetrical.

The first antennae are longer than in the female and reach the genital segment. The right one is geniculate, and four of its middle segments, beginning with the second one behind the hinge, are enlarged to twice the diameter of the others and the first two have a crest fringed with small teeth on their outer margin. The second antennae, mouth parts, and first four pairs of legs are like those of the female. The fifth legs are shown in figure 204; each is uniramose and 4-segmented. The terminal segment of the right leg is transformed into a stout spherical chela without spines or processes. The terminal segment of the left leg is tipped with a slender, curved claw and a stout spine. The second segment of this leg carries at its distal end a small spine which might be regarded as the rudiment of an endopod. Total length 2.90 mm. Metasome 2.40 mm. long, 0.76 mm. wide.

Types.—U. S.N.M. No. 70747, off Robben Island, Okhotsk Sea.

Remarks.—The complicated asymmetry of the urosome in the female and the last segment of the metasome in the male are sufficient to identify this new species. It appears to be local in its distribution.

PONTELLA SECURIFER Brady

PLATE 17, FIGURES 207–214; PLATE 28, FIGURES 421–425

Pontella securifer BRADY, Voyage of H. M. S. *Challenger*, Zool., vol. 8, pt. 23, Copepoda, p. 96, pl. 45, figs. 1–9, 1883.

Stations 3; 5; 13; 16; 19; 31; 223; 3829; 3930; 3932; 3980; 3981; 4009; 4010; 4037; 4190; 4712; 4952; 5133; 5155. Figured and very briefly described in 8 lines by Brady in his *Challenger* report from a few specimens from the mid-Pacific; again figured and briefly described, 4 lines only, by Giesbrecht in his Naples monograph. Later listed from 13 *Siboga*, 2 Monaco, and 4 *Carnegie* stations without further description or figures. A number of females and males were found at these *Albatross* stations, of which the first 6 were identified by Sars, who also made some excellent pencil drawings of them. As Brady's and Giesbrecht's descriptions and figures, the only ones ever published, are not only very inadequate but also misleading in some details, Sars' figures are here reproduced with full descriptions of both sexes.

Female.—Metasome elliptical, four times as long as wide and but little narrowed at each end. Head more or less fused with the first segment, the lateral hooks small and nearly straight. Dorsal eyes well separated, the two rostral lenses with their inner walls in contact and swollen into a large sphere. Posterior corners of metasome produced into triangular acute spines, the one on the left much larger

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than the one on the right and reaching the center of the caudal rami. Urosome nearly half as wide as the metasome but less than a fifth as long and 2-segmented. Genital segment much larger than the anal segment and covered with an irregular dorsal carapace, which is widened posteriorly and extends backward to cover all the anal segment and more or less of the caudal rami. In both Brady's and Giesbrecht's figures this dorsal carapace is widened but little posteriorly, and is armed on the dorsal surface with several processes and spines arranged irregularly, as seen in figure 422, and much of both caudal rami is visible dorsally. This was true of only two of the *Albatross* specimens; in all the others the entire left ramus was covered and most of the right one, and in three specimens nothing could be seen of the rami from above. Again the posterior margin of this carapace is not uniform but varies considerably. In most of the specimens it was like that shown in figure 207 or the slight variation seen in figure 209, but in two females it was shaped as in figure 421, and in three others it had the scalloped margin seen in figure 423. The right caudal ramus is twice as large as the left and each is armed with five plumose setae.

The first antennae are rather slender and reach the middle of the third thoracic segment. The exopod of the second antenna is slender and considerably shorter than the endopod. The maxillipeds are large and stout and armed with strong setae. The endopods of the first legs are made up of three segments, the first with one, the second with two, and the third with five inner setae. Each ramus of the fifth leg is 1-segmented, the exopod four times as long as the endopod, strongly curved inward, with four small spines on the convex margin and acuminate at the tip. The endopod is bifurcate for about one-third of its length and attached at an angle to the inner distal corner of the basipod. Total length 4.25 to 4.50 mm. Metasome, including the spines at the posterior corners, 4 mm. long, 0.90 mm. wide.

Male.—Metasome similar to that of the female but narrower, more pointed anteriorly, and with nearly symmetrical spines on the posterior corners, reaching the posterior margin of the genital segment. Head separated from the first segment, its lateral hooks longer than those of the female and curved. Urosome less than a fourth as wide as the metasome and 5-segmented; Brady's statement that it is 3-segmented is erroneous; it is perfectly symmetrical in strong contrast to the very irregular urosome of the female. The caudal rami are also symmetrical, more than three times as long as wide, and slightly curved, each with five setae, one of which is sometimes lengthened.

The grasping (right) antenna is shown in figure 212 and corresponds to those figured by Brady and Giesbrecht. The other appendages are like those of the female except, of course, the fifth legs. In the chela of the right fifth leg the movable finger is slender and

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bent into a half circle, and the thumb is short, straight, and blunt. Inside of the thumb is a longer curved process, transversely ridged, then an acute spine and a hemispherical process. The end segment of the left leg is tipped with two equal spines, with three other spines and long rows of hairs on the surface. The fifth legs of each of the 35 males were apparently like all the others. Total length 4.10 mm. Metasome 3.33 mm. long, 0.83 mm. wide.

Remarks.—The female of this species shows a great deal of variation, and there might be an inclination to create several varieties. But since the males do not show any tendency toward variation it seems better to keep them all together in a single undivided species. A fully developed male and two females have been given U.S.N.M. No. 74132, and five females showing differences in the dorsal pattern of the urosome have received U.S.N.M. No. 74133. Figures 211 and 214 are from immature specimens, figures 424 and 425 from fully developed specimens.

PONTELLA SURRECTA, new species

PLATE 29, FIGURES 426–430

Stations 5110; 5262; Romblon Island, and Nasugbu Bay, Philippine Islands. A single female was taken at the surface at Romblon Island and three females and a male at Nasugbu Bay, southern Luzón. Since the description of this species was written, additional specimens were found from station 5110 off southern Luzón and from station 5262 off eastern Mindoro, Philippine Islands.

Female.—Metasome elliptical, two and a half times as long as wide; head short and very wide, with curved lateral hooks. Fourth and fifth segments fused and somewhat squarely truncated posteriorly, with asymmetrical spines at the corners. The one on the left side is longer and wider than the one on the right, and both are lobed on the inside at the base and mucronate at the tip. The urosome is less than a fourth as wide and a fifth as long as the metasome and 2-segmented. The genital segment is three times as long as the anal and is turned upward at its posterior end into a dorsal protuberance as large as the segment itself. The protuberance is curved over backward and twisted a little to the left entirely concealing the abdomen in dorsal view. It ends in a point over the left caudal ramus, which is considerably smaller than the right one.

The first antennae are slender and short, not reaching the center of the third thoracic segment. The exopod of the second antenna is very slender, much shorter than the endopod, and made up almost entirely of the second segment. Both rami of the first legs are 3-segmented, the endopod just reaching the distal end of the second exopod segment. The first endopod segment carries one inner seta, the second

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segment two, and the third segment five. The outer spine on the second exopod segment is considerably enlarged. The fifth legs are not quite symmetrical, the left one a little larger than the right. The exopods are three times as long as the endopods, curved inward, and each has a small spine at the center of the outer margin. The endopod is very small, its distal third bifurcate with the branches acutely pointed. Total length, including caudal rami, 3.60 mm. Metasome 3 mm. long, 1.20 mm. wide.

Male.—Metasome more slender than in the female, almost three times as long as wide, and narrowed considerably posteriorly, a small protuberance at the left posterior corner but only the rudiments of one at the right corner. Urosome symmetrical, a third as long as the metasome if the caudal rami are included and a fifth as wide, 5-segmented, the anal segment very short. Caudal rami as long as the last three abdominal segments combined and curved like parenthesis marks.

First antennae as short as in the female, the right one geniculate; second antenna, mouth parts, and first four pairs of legs like those of the female. The fifth legs are very simple and of small size; the movable finger of the chela on the right leg is slender, nearly straight, and armed on its inner margin with two small setae. The hand is also slender and unarmed, while the thumb is rodlike, attached to the very base of the hand and curved inward. The last segment of the left leg is pointed and covered with hairs. Total length, including caudal rami, 3.40 mm. Metasome 2.67 mm. long.

Types.—U.S.N.M. No. 74134; Romblon Island, Philippine Islands.

Remarks.—This species is easily recognized by the large dorsal upturn of the posterior end of the genital segment and the asymmetry of the posterior corners of the metasome. The upturn has given rise to the specific name, and the extension of the musculature to its very tip shows it to be an intrinsic part of the segment itself and not an extrinsic growth.

PONTELLA TENUIREMIS Giesbrecht

PLATE 17, FIGURES 215–219; PLATE 29, FIGURE 431

Pontella tenuiremis GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 5, sem. 2, p. 28, 1889; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 462, 477, pl. 24, figs. 6, 24–26; pl. 40, figs. 3, 4, 7, 37, 1892.

Stations 15; 3822; 3878; 3898; 4010; 4011; 4642; 4660; 4683; 4685; 4696; 4700; 4735; 4738; 5415; Ellice Islands; Beaver Harbor, Vancouver Island, British Columbia. Established by Giesbrecht upon specimens taken in the tropical Pacific; subsequently reported by Thompson and Scott (1903, p. 252) from Ceylon; and found well distributed in the Pacific by the *Carnegie*. Dana wrongly assigned

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the male from the Wilkes plankton to the species *fera* (see remarks under this species, p. 293). Giesbrecht's description and figures are the only ones thus far published, and again Sars' pencil sketches differ from them in enough details to warrant their reproduction here. A comparison of the urosomes shown in figures 215 and 216 with those appearing in figures 3 and 4 of plate 40 of the Naples monograph will show that in this genus, where the urosome is often so asymmetrical as to become grotesque or bizarre, too much specific value must not be placed upon its exact details. They must be expected to vary in a greater degree than in those genera where normal symmetry prevails. In consequence, the details of the appendages assume greater specific value.

PONTELLA VALIDA Dana

PLATE 20, FIGURES 432–444

Pontella valida DANA, United States Exploring Expedition, 1838–1842 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1171, 1853; pl. 82, fig. 6a–g, 1855.

Stations 5105; 5133; 5175; 5176; 5299; 5460; Butauanan Island, Philippine Islands. In the Wilkes plankton Dana described a species that he named *valida*, founded upon male specimens from north of New Zealand. From the *Challenger* plankton Brady described both sexes of a new species that he called *elephas*. The descriptions of the male as given by Dana and Brady correspond so fully as to leave no doubt that they are the same species. This gives Dana's specific name, *valida*, precedence and makes Brady's name *elephas* a synonym. It was not present in any of the other plankton lists.

Claus (1893, p. 274), in a "Revision of the Pontellidae," established a new subgenus *Ivellopsis*, to include Dana's and Brady's species, although he acknowledged that the details of the two species were really too meager to warrant such an action. Giesbrecht (1898, p. 139), however, upon the same meager details raised the subgenus to full generic rank, discarding Dana's species as invalid. The generic diagnosis given is inaccurate and contains no real generic difference, so the genus cannot be accepted. This species corresponds so closely in its general makeup to the other species of the genus *Pontella* that it must be placed in that genus. The plankton at these *Albatross* stations contained specimens of both sexes in sufficient numbers to permit the complete redescription.

Female.—Metasome elliptical, a little less than three times as long as wide; head triangular and rather sharply pointed in front but without a crest. Rostrum stout and pointed directly downward, the distal third bifurcate without a lens. Dorsal eyes large, close together, and more or less concealed by their opaque covering. Fourth and fifth segments separated, the latter very short and squarely truncated

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with small triangular spines at the posterior corners. Urosome one-fourth as long as the metasome and one-third as wide; 3-segmented. Genital segment rectangular, one-half longer than the two abdominal segments combined, with a rounded process on each side near the base and a conical process near the center of the ventral surface. Brady's figure (1883, pl. 38, fig. 14) gives the idea that the lateral processes are below the level of the dorsal surface of the segment, but he says nothing about it in the text. In reality they are flush with the dorsal surface and extend only a short distance down on the lateral surface. The left process is a little larger than the right and nearer the base of the segment, and each is joined to the segment by a narrow neck. The abdomen is 2-segmented, the two segments being about the same length, but the anal segment is cut nearly to its base by a triangular anal sinus. The caudal rami are somewhat divergent, enlarged distally, and more than twice as long as wide, with a fringe of hairs on their inner margins.

The first antennae reach only to the center of the third thoracic segment; the exopod of the second antenna is shorter than the endopod and 5-segmented, with four setae. The chewing blade of the mandible is considerably widened distally and armed at the outer corner with two large blunt teeth tipped with minute spines, and separated by a wide and deep sinus. Then come two medium blunt teeth, tipped with minute spines, close together, and three small sharp teeth at the inner corner with a seta on the lateral margin. The first maxilla is almost exactly like that of *Pontella lobiancoi* as figured by Giesbrecht. The maxilliped is 7-segmented, the second segment as long as the first and armed with five processes on the inner margin carrying setae. The five distal segments combined are no longer than the second segment and each carries two setae on its inner margin. The exopods of the first four pairs of legs are 3-segmented; the end segment with two spines on the outer margin, one at the distal corner and a terminal spine as long as the segment itself, with an outer serrate flange. The endopods reach the distal end of the second exopod segment, the first endopod 3-segmented, the others 2-segmented. Each fifth leg is biramose, the rami 1-segmented, the exopod three times as long as the endopod, with three small spines on its outer margin and two at the tip. The endopod is acuminate, unarmed, and undivided. Total length 3.20 mm.

Male.—Metasome elliptical and not narrowed at either end; head broadly rounded in front and without the spine shown in Brady's figure. Fourth and fifth segments completely fused and smoothly rounded at the posterior corners. Urosome made up of four segments of about the same length and width, the anal segment without a posterior sinus. Caudal rami elongate, divergent, not enlarged distally, and three times as long as wide.

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The right first antenna is geniculate, the terminal portion made up of four indistinctly separated segments. The enlarged middle section of this antenna has on its inner margin three large fingerlike processes similar to those figured by Scott in the *Siboga* plankton upon the antenna of *forficula*. The second antenna, mouth parts, and first four pairs of legs correspond to those of the female. The two fifth legs are about the same length; the chela on the right leg is subrectangular, the hand turned back along the second segment. The movable finger at the distal end of the hand is elongate and bent abruptly at right angles near its center, with three setae on its inner margin. The thumb at the base of the hand is rodlike, curved, and unarmed. Total length 3 mm. Metasome 2.50 mm. long, 1.10 mm. wide.

Remarks.—Brady's specimens came from among the Philippine Islands, as did these Albatross specimens. A male and female have been given U.S.N.M. No. 74135 as specimens of the two sexes here united.

Genus PONTELLINA Dana, 1853

PONTELLINA PLUMATA (Dana)

Pontella plumata Dana, Proc. Amer. Acad. Arts and Sci., vol. 2, p. 27, 1849.
Pontellina plumata Dana, United States Exploring Expedition, 1838–1842 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1135, 1853; pl. 79, fig. 10a–d, 1855.

Stations 5; 7; 15; 24; 26; 27; 30; 65; 2195; 3799; 3829; 3878; 3901; 3980; 4009; 4010; 4037; 4190; 4588; 4615; 4638; 4644; 4646; 4648; 4735; 4743; 4765; 4952; 5102; 5133; 5134; 5155; 5175; 5180; 5186; 5190; 5196; 5223; 5231; 5246; 5262; 5319; 5320; 5334; 5338; 5382; 5415; 5530; H. 3782; Sabtán Island, Philippine Islands; Fiji Islands; Marshall Islands. Present in all the plankton lists and widely distributed but in limited numbers.

Genus PONTELLOPSIS Brady, 1883

PONTELLOPSIS ALBATROSSI, new species

PLATE 30, FIGURES 445–449

Stations 3878; 4009. Two females were found at station 4009 between Kauai and Oahu, Hawaiian Islands, in a surface tow. This species is also recorded by Wilson from south of Lanai Island, station 3878.

Female.—Metasome elliptical, two and a quarter times as long as wide; head separated from the first segment and broadly rounded in front, with a median projection over the base of the rostrum. Fourth and fifth segments separated, the latter very short and produced at its posterior corners into triangular spines reaching back to the center of the genital segment. Urosome nearly half as wide as the metasome

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and a third as long and 2-segmented. Genital segment twice as long as the abdomen, with a long fingerlike process at the center of the ventral surface curved backward. The segment is covered with a dorsal carapace, which has a large tooth on the left margin pointing backward. The carapace is prolonged over the abdomen and almost reaches the posterior margin of the latter. The single abdominal segment is very short, but as wide and as thick as the genital segment. The caudal rami are attached on a level with the dorsal surface of the abdomen, and the left one is larger than the right.

The first antennae are rather slender and reach to the end of the third thoracic segment. The exopod of the second antenna is very slender and scarcely half as long as the endopod. There is a small spherical eye on the ventral surface just behind the rostrum that has a deep red color in the preserved specimens. Each ramus of the first legs is 3-segmented, the endopod reaching the distal end of the second exopod segment. The outer spines on the three exopod segments are long, slender, and acuminate; the terminal spine of the end segment is very short and weak. The inner setae on the segments of the endopod number 1, 2, and 6, respectively, while those on the exopod number 0, 1, and 5. The fifth legs are very large for the size of the copepod; the endopod is bifurcate for a third of its length, the branches rather blunt. The exopod is thickened at its base and three times as long as the endopod, with three small spines on its outer margin, a large one at its tip and a larger one still on the inner margin some distance from the tip. Total length 3 mm. Metasome 2.25 mm. long, 1 mm. wide.

Types.—U.S.N.M. No. 74136: station 4009, latitude 21°50′30″ N., longitude 159°15′ W., Hawaiian Islands.

Remarks.—This species is distinguished by its robust form, by the tooth on the left side of the dorsal carapace and the fingerlike process at the center of the ventral surface of the genital segment. It is evidently quite restricted in its distribution.

PONTELLOPSIS ARMATA (Giesbrecht)

PLATE 30, FIGURES 450–452

Monops armatus GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 5, sem. 2, p. 28, 1889; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 487, 490, pl. 26, figs. 19, 26, 27; pl. 41, figs. 46, 47, 58, 1892.

Sations 16; 2937; 3822; 3878; 4009; 4010; 4190; 5129; 5175; 5186; 5223; 5228; 5234; 5340; 5382; 5422. Established by Giesbrecht upon specimens obtained east of the Philippine Islands and found in the *Albatross* plankton well distributed among the islands themselves. Present also in the *Siboga* and *Carnegie* planktons. Giesbrecht gave

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as the first characteristic of his new species, "Rumpf behaart," but his figure (*op. cit.*, pl. 41, fig. 47) does not show any hairs at all. Nor does it show how near the anterior margin of the last metasome segment is attached the curious "gekrümpten Fortsatz" on the right side. Both of these facts are clearly shown in the figure here presented (fig. 450), and two other figures are added, one of the grasping antenna of the male and the other of the fifth legs of the female.

PONTELLOPSIS BITUMIDA, new species

PLATE 30, FIGURES 453–457

Stations 5105; 5175; 5299; Port Binanga, Luzón, Philippine Islands. Both sexes were found in small numbers at each of these stations.

Female.—Metasome elliptical, two and a half times as long as wide; head separated from the first segment and narrowly rounded in front with a small projection over the base of the rostrum. Posterior corners of the last segment smoothly rounded and without spines or projections. Urosome, excluding the caudal rami, a little more than a fourth as long and less than a fourth as wide as the metasome and 3-segmented. The segments are about the same length and width, and the anal segment is invaginated on its posterior margin. The caudal rami are longer than the anal segment and curved like parenthesis marks, each with five setae. The entire urosome is perfectly symmetrical and without spines, projections, or armature of any sort.

First antennae slender and reaching the middle urosome segment; the exopod of the second antenna is a third as long as the endopod. The endopod of the first leg is 3-segmented and reaches the center of the end segment of the exopod. The fifth legs are rather small, the exopods twice as long as the endopods, with four small spines on the outer margin, a large one at the tip and another large one on the inner margin. The endopod is bifurcate for about half its length, the branches blunt and uneven in length. Total length, including caudal rami, 1.77 mm. Metasome 1.30 mm. long, 0.52 mm. wide.

Male.—Metasome shorter and wider than in the female; head broadly rounded in front, with a similar projection over the base of the rostrum. Fourth and fifth segments separated, the posterior corners of the latter very asymmetrical. On the left corner is a short and blunt fingerlike process inclined outward, while on the right is a long sickle-shaped spine reaching the anal segment. This spine ends in an acuminate point and is barbed on the inside at its base.

The urosome is 5-segmented, the first four segments about the same length, the anal segment longer. The second and third segments each project on the right side in a short rounded knob, which is con-

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spicuous in dorsal view, the two giving rise to the specific name. The caudal rami are longer than the anal segment and wider than in the female.

The first antennae are about the same length as in the female, and the right one is geniculate. As can be seen in figure 455, the basal segments are considerably widened and the ones next to the swollen knob are narrowed. The knob is abruptly widened, and its distal segment is toothed on the inner margin. The segment next to the hinge has along its inner margin a row of small teeth; the terminal portion beyond the hinge is very slender and indistinctly segmented. The second antennae, mouth parts, and first four pairs of legs are like those of the female. The fifth legs are exceptionally simple; the hand of the chela on the right leg is triangular, the apex jointed to the second basipod, the finger at one basal angle, the thumb at the other. The end segment of the left leg is tipped with two small spines. Total length 1.54 mm. Metasome, without posterior spine, 1.15 mm. long.

Types.—U.S.N.M. No. 74137 [types not returned by Dr. Wilson], Port Binanga, Luzón, Philippine Islands.

Remarks.—This species can be recognized by the perfect symmetry of the urosome in the female and the long sickle-shaped spine at the right posterior corner of the metasome in the male.

PONTELLOPSIS BREVIS (Giesbrecht)

PLATE 30, FIGURE 458

Monops brevis GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 5, sem. 2, p. 28, 1889; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 487, 497, pl. 26, figs. 16, 35, 36; pl. 41, figs. 42, 52, 70, 1892.

Stations 3980; 5223; 5348. Established by Giesbrecht upon specimens from the Abrolhos Islands off the coast of Brazil but not appearing in any of the plankton lists. These *Albatross* specimens are the first from the Pacific Ocean. The fifth leg of the female, shown in the figure, is quite distinctive in the relative lengths of the rami and the spinules on the outer margin of the exopod. The caudal rami are twice as long as wide, and the genital segment has two small fingerlike processes at its right posterior corner.

PONTELLOPSIS DIGITATA, new species

PLATE 31, FIGURES 463–465

Station 3980. Two females were found in the plankton of this station between Honolulu and Kauai Island in the Hawaiian Islands. They cannot be referred to any of the known species.

Female.—Metasome broadly elliptical, a little more than twice as long as wide; head evenly rounded in front, with a median projection

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over the base of the rostrum. Fourth and fifth segments fused, squarely truncated posteriorly and produced at the corners into acute triangular spines overlapping the genital segment. Urosome less than a third as long as the metasome and three-eighths as wide, very asymmetrical and 2-segmented. Genital segment twisted to the right, widened posteriorly, protuberant ventrally, with two small blunt spines at the tip of the protuberance and covered with a stiff chitinous carapace. At the posterior margin of the genital segment a stout fingerlike process is attached to the dorsal surface of the carapace, suggesting the specific name. This finger points diagonally upward and backward and reaches the posterior margin of the caudal rami. It appears to belong exclusively to the carapace and is not connected with the segment itself; the ventral protuberance on the contrary is part of the segment and has no connection with the carapace. The single abdominal segment is much shorter than the genital segment and is incised at the center of its posterior margin. The caudal rami are kidney-shaped and extend diagonally along the lateral margins of the abdomen, each with five very short setae.

First antennae rather slender and very short, reaching only to the center of the second thoracic segment. In the second antennae the exopod is slender and much shorter than the endopod; the mouth parts and first four pairs of legs do not show specific characters. In the fifth legs the exopod is four times as long as the endopod, with three small spines on the outer margin, a large terminal spine and a larger one still on the inner margin somewhat back of the tip. The distal third of the endopod is bifurcate, the branches acuminate. There is a protruding knob on the basipod outside the attachment of the exopod, and the base of the exopod is abruptly narrowed to fit around it. Total length 4.50 mm. Greatest breadth 1.40 mm.

Types.—U.S.N.M. No. 74139; Station 3980; latitude 21°23′ N., longitude 158°19′ W., Hawaiian Islands.

Remarks.—The most conspicuous specific characters are the fingerlike processes on the carapace of the genital segment and the kidney-shaped caudal rami.

PONTELLOPSIS GLOBOSA, new species

PLATE 31, FIGURES 466–469

Station 5223. Five females were found in a surface tow at this station between Marinduque and Luzón Islands in the Philippines.

Female.—Metasome stoutly elliptical, two and a half times as long as wide; head broadly rounded in front with a median projection over the base of the rostrum. Fourth and fifth segments fused with stout spines at the posterior corners, which reach to the center of the first abdominal segment. Urosome short and symmetrical, a third as long

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and a fourth as wide as the metasome, 4-segmented. Genital segment nearly as long as the first two abdominal segments combined and perfectly symmetrical. Abdomen as wide as the genital segment, the anal segment longer than either of the first two segments and invaginate at the center of the posterior margin. Caudal rami as long as the anal segment, one-half longer than wide and slightly divergent, each with one outer and four terminal setae and an appendicular seta at the inner corner.

First antennae stout at the base but quickly becoming slender and reaching the center of the second thoracic segment. Exopod of the second antenna only a third as long as the endopod, and its setae not reaching the distal end of the endopod. In the first four pairs of legs the exopods are all 3-segmented, the first endopod is a single segment without dividing grooves, but the setae give evidence that it is really three segments fused. The second, third, and fourth endopods are 2-segmented. The fifth legs are peculiar and furnish the chief characteristic that separates this from the other species of the genus. The exopod is stout and twice as long as the second basipod, with two small spines on the outer margin, a third at the tip, and a much larger one subterminal on the inner margin. The endopod is globular, less than one-fourth as long as the exopod, and this gives rise to the specific name. It is unlike the other species in that it is neither bifurcate nor pointed at the tip but is armed there with a stout spine curved outward. Total length 2.10 mm. Metasome 1.64 mm. long (midline), 0.66 mm. wide.

Types.—U.S.N.M. No. 74140; station 5223, latitude 13°36′ N., longitude 121°25′ 30″ E., off Santa Cruz, Philippine Islands.

Remarks.—The globular endopods of the fifth legs tipped with a stout curved spine and the perfect symmetry of the urosome are the best details for the identification of the species.

PONTELLOPSIS LAMINATA, new species

PLATE 31, FIGURES 470–475

Station 5340. Forty specimens, females and two immature males, were taken at a depth of 17 to 22 fathoms at this station off Palawan Island in the Philippines.

Female.—Metasome short and stout, nearly half as wide as long and broadly rounded anteriorly, with a central projection over the base of the rostrum. Fourth and fifth segments fused and squarely truncated posteriorly, with small spines at the corners, the left one slightly larger than the right. Urosome, including the caudal rami, half as long as the metasome and more than half as wide, and very asymmetrical. Genital segment increasing in width to its posterior margin, where it is as wide as long. First abdominal segment one-half wider than

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the genital segment, with an acute spine on each lateral margin. The one on the left is long and narrow and points diagonally backward, while the right one is shorter and wider and extends outward at right angles to the urosome axis. To the dorsal surface of the segment at the right posterior corner are attached two rounded laminae. The smaller anterior one is elliptical in outline and is usually turned down over the ventral surface. The larger posterior one extends backward and inward above the anal segment and caudal rami and reaches the tips of the caudal setae. There is another smaller lamina attached to the posterior margin of the segment and extending back over the anal segment and beyond its posterior margin. Usually these three complete the laminate armature of the urosome, but in one female there was a fourth large lamina attached to the left side and sweeping around backward and overlapping the one from the right. These laminae are chitinous and perfectly transparent but of course brittle and likely to be broken off. They still remained intact, however, in 75 percent of the specimens. The genital protuberance on the ventral surface of the genital segment is at the posterior margin, and in most of the females a single spermatophore was attached to it. The long narrow discharge tube swept around and up over the right side of the urosome, and the body of the spermatophore trailed backward on the top of everything else. The anal segment is much shorter than the first abdominal segment and invaginate posteriorly. The caudal rami are but little longer than wide, with the outer seta at the center of the outer margin and the others terminal.

The first antennae are very slender and often extend forward and a little divergent; when turned backward they reach the first abdominal segment. The exopod of the second antenna is only one-fifth as long, as the endopod is very slender and has five terminal setae. The mandible has five larger teeth on the outside of the chewing blade and four smaller ones on the inside; the palp is biramose and very indistinctly segmented. The exopods of the first four pairs of legs are 3-segmented, the endopods of the first legs 3-segmented, of the others 2-segmented. In the fifth legs the exopod ends in a long stout spine, with another stout spine at about the center of the inner margin and three minute spines on the outer margin. The endopod is half as long as the exopod and its distal half is bifurcate, the branches blunt. Total length 2 mm. Metasome 1.40 mm. long, 0.67 mm. wide.

Types.—U.S.N.M. No. 74141; station 5340, latitude 10°55′51″ N., longitude 119°14′12″ E., Malampaya Sound, Palawan, Philippine Islands.

Remarks.—In the genus *Pontella* the urosome of some species has chitinous attachments that cannot be classed as appendages. Here is an example of the same thing in the genus *Pontellopsis*, and these

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laminae together with the attached spermatophore identify the species at once.

PONTELLOPSIS LUBBOCKII (Giesbrecht)

PLATE 30, FIGURES 459–461

Monops lubbockii GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 5, sem. 2, p. 29, 1889; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 487, 496, pl. 26, figs. 18, 32; pl. 41, figs. 60, 63, 68, 1892.

Station 31. Established by Giesbrecht upon specimens from the tropical Pacific and found only in the *Carnegie* plankton lists. Figures of the fifth legs of a male and female obtained from this *Albatross* station off the Galápagos Islands and the grasping antenna of the male are here introduced for comparison. The chief specific character shown in the fifth legs of the female is the very long and slender spine at the tip of the exopod, with a stout spine on each margin at its base. In the fifth legs of the male there is a rounded knob at the distal end of the first segment of the right leg, two setae on the outer margin of the second segment, and the third segment is a stout chela. In the left leg the end segment has a distinctive terminal armature. In the enlarged portion of the grasping antenna the three proximal segments are beveled on the distal side at the outer margin.

PONTELLOPSIS PERSPICAX (Dana)

Pontella perspicax DANA, Proc. Amer. Acad. Arts and Sci., vol. 2, p. 32, 1849.
Pontellina perspicax DANA, United States Exploring Expedition, 1838–42 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1155, 1853; pl. 81, fig. 2 a–d, 1855.

Stations 4706; 4765; 5340. Established by Dana upon specimens from the tropical Atlantic north of the Equator and reported from there in the *Carnegie* plankton. Reported by Scott in the *Siboga* plankton from the tropical Pacific.

PONTELLOPSIS REGALIS (Dana)

PLATE 33, FIGURES 494–496′

Pontella regalis DANA, Proc. Amer. Acad. Arts and Sci., vol. 2, p. 31, 1849.
Pontellina regalis DANA, United States Exploring Expedition, 1838–42 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1154, 1853; pl. 81, figs. 1 a, b, 1855.

Stations 15; 27; 30; 32; 3878; 4009; 4571; 4588; 4592; 4615; 4618; 4619; 4640; 4648; 4649; 4652; 4667; 4710; 4718; 4719; 4743; 5133; 5176; 5223. Identified by Sars from 17 of these *Albatross* stations and from 5 Monaco stations; found in all the plankton lists except the *Challenger*. In the *Albatross* plankton it is most widely distributed, but has never been reported as abundant anywhere. One of the females captured at station 3878 in the Hawaiian Islands had a

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urosome like that shown in figure 496′. The distal corner of the genital segment on the right side was prolonged diagonally outward and backward into a slender finger process, while the left side was smoothly rounded. Otherwise this specimen was just like all the others, and its fifth legs proved it to be *regalis*.

PONTELLOPSIS SINUATA, new species

PLATE 33, FIGURES 497–502

Stations 2937; 5223. Nine females and a male were obtained from a surface tow at the first of these stations, the type locality, off the coast of southern California. Additional specimens were taken off Santa Cruz, Philippine Islands, station 5223.

Female.—Metasome elliptical, a little more than twice as long as wide; head broadly rounded in front, with a slight median projection over the base of the rostrum. Fourth and fifth segments fused, with triangular spines at the posterior corners pointed diagonally outward and backward and reaching the distal margin of the genital segment. Urosome one-third as long as the metasome, 3-segmented, and considerably distorted. Genital segment bent to the right at its distal end and downward; the two abdominal segments partially fused, as wide as the genital segment, and bent first downward and then upward at the tip, giving the urosome an S-curve when viewed laterally, whence the specific name. There is a ventral protuberance at the center of the genital segment tipped with a short process, and the dorsal surface of the first abdominal segment is prolonged backward over the anal segment and projects as a rounded tongue between the caudal rami. The latter are nearly as wide as long, the left one larger than the right and each with five setae, the outer one at the center of the outer surface.

The first antennae are short and slender, just reaching the third thoracic segment. The exopod of the second antenna is much shorter than the endopod, and its terminal setae scarcely reach the tip of the latter. The exopod of the fifth legs is twice as long as the endopod and curved inward, with two small spines on its outer margin. The tip is bifurcate for a short distance, with blunt branches, and farther down on the inner margin is a large spine of varying size but usually larger than the tip. The endopod is bifurcate for half its length, the branches slender and blunt. Total length 4.24 mm. Metasome 3.50 mm. long, 1.50 mm. wide.

Male.—Metasome a little smaller and narrower than in the female, almost three times as long as wide if the posterior spines are included. Head separated from the first segment, and the fourth segment from the fifth, the latter with spines at the posterior corners much longer than in the female, reaching the anal segment. Urosome cylindrical

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and 5-segmented, just a fourth as long as the metasome on the midline and about a fourth as wide. The genital segment is as long as the two following segments combined and a trifle wider; the other four segments are the same width but vary a little in length. The caudal rami are as long as the last two segments combined, subrectangular in outline, close together, and parallel.

The first antennae are a little longer than in the female, and the enlarged portion of the right or grasping antenna is shown in figure 501. The most prominent characteristic is the curved points on the outer margins of the three distal segments and the stout spine on the inner margin of the last one. The second antennae, mouth parts, and first four pairs of legs are like those of the female. The fifth legs are seen in figure 502, and they present several specific characters. The movable finger on the chela of the right leg is spatulate, tipped with two spines and armed with three others on the inner margin at the base. The thumb is short and stout and squarely truncate at the tip, with a small spine at each corner. The left leg is 3-segmented, with tufts of hairs on the inner margin at the two joints. The end joint is tipped with three spines, the two outer ones acute, the central one longer, curved, and blunt. Total length 3.75 mm. Metasome 3.25 mm. long, 1.2 mm. wide.

Types.—U.S.N.M. No. 74142; station 2937, latitude 33°04′30″ N., longitude 117°42′ W., off southern California.

Remarks.—The fifth legs of the male are so distinct as to establish the validity of the species at once, but the fifth legs of the female are almost exact replicas of those of *bitumida*. However, this female is twice the size of the *bitumida* female; its first antennae reach only to the third segment and its metasome ends in stout acute spines. Furthermore, its urosome is asymmetrical and its caudal rami are as wide as long.

PONTELLOPSIS STRENUA (Dana)

PLATE 31, FIGURES 476–480

Pontella strenua DANA, Proc. Amer. Acad. Arts and Sci., vol. 2, p. 32, 1849.
Pontellina strenua DANA, United States Exploring Expedition, 1838–42 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1158, 1853; pl. 81, fig. 4 a–d, 1855.

Stations 27; 3980; 4037; 4619; 4640; 4684; 4695; 5134; 5319; 5340; Caldera Bay anchorage, west coast of Mindanao, Philippine Islands. Established by Dana upon male specimens from south of the Kingsmill Islands in the tropical Pacific and put in the genus *Pontellina;* transferred to the genus *Pontella* by Brady in the *Challenger* plankton, and to *Pontellopsis* by Scott in the *Siboga* plankton, all specimens being males. Giesbrecht (1892, p. 496) listed both sexes, but gave only a short description and but one detail for the female. A full description of both sexes is here given, and, since Dana's original types have long

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since disappeared, a male and female have been designated to serve as neotypes.

Female.—Metasome elliptical, twice as long as wide and narrowed but little at each end. Head separated from the first segment and broadly rounded in front, with a small median protuberance over the base of the rostrum. Fourth and fifth segments separated, the spines at the posterior corners of the latter acuminate and reaching almost to the posterior margin of the genital segment. These spines are flanged on the inside at the base, with a small knob at the inner corner of the flange. Urosome more than a fourth as long and wide as the metasome, somewhat asymmetrical, and 2-segmented. Genital segment as wide as long and without a ventral protuberance, but with the upper surface produced at the left posterior corner into a finger-like process that just reaches the left caudal ramus. Anal segment wider than long and obliquely truncated at the posterior corners. Caudal rami asymmetrical, the right one half as large again as the left, each with five setae of equal length.

First antennae short, reaching only to the middle of the fourth thoracic segment and sparsely setose. Endopod of second antenna much longer than the exopod and very slender. Endopod of first legs 3-segmented and just reaching the distal margin of the second exopod segment. Exopods of fifth legs twice as long as endopods and curved inward, with three small spines on the outer margin and three larger ones at the tip, one terminal and the other two on the inner margin close to it. The distal half of the endopods is bifurcate, with acute branches. The first basipod in each leg has a large knob on its outer margin close to the distal end. Total length 2.50 mm. Metasome 2.24 mm. long, 1.05 mm. wide.

Male.—A little smaller than the female; metasome short and stout, but with the spines at the posterior corners asymmetrical. The one on the right side is long, slender, and more or less curved, reaching the third or the fourth segment of the urosome according to the amount of curvature. The spine on the left is straight, acuminate, and a fourth to a half as long as the other. The urosome is a third as long and wide as the metasome and 5-segmented, the segments about the same width but differing in length. The third segment of the urosome has a small knob projecting laterally on the right side and plainly visible in dorsal view. The caudal rami are symmetrical, enlarged distally, and twice as long as wide, the outer seta on the outer margin one-third of the length from the distal end.

The first antennae are a little longer than in the female, and the enlarged portion of the right one is shown in figure 477. This has two distinctive specific characters: first, the exceptionally long terminal portion, which apparently contains but two segments (although the arrangement of the setae on the second of these segments indicates

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that it is really three segments fused) and second, the perfectly smooth outer margin of the enlarged segments, which in most species is quite irregular. The second antennae, mouth parts, and first four pairs of legs are similar to those of the female. The right fifth leg is very much longer than the left, the hand of the chela is subtriangular, the apex is articulated with the second segment, the thumb and finger at the free corners. The thumb is longer, slender, and pointed; the finger is shorter, stouter, and blunt, with two inner setae. The second segment of the left leg has a long process at the outer distal corner and the end segment is tipped with two small spines. Total length 2.25 mm. Metasome 1.85 mm. long, 0.90 mm. wide.

Neotypes.—U.S.N.M. No. 74144. These types are labeled by Dr. Wilson as from Endeavour Strait, north of Queensland, Australia, but without other data.

Remarks.—This species is so closely related to *regalis* that it is difficult to separate the two. However, if the two are placed together they can be easily distinguished by their respective size, *regalis* being twice as large as *strenua.* Though so similar there are enough differences in the fifth legs of both sexes as well as in the urosomes to separate the species.

PONTELLOPSIS VILLOSA Brady

PLATE 30, FIGURE 462

Pontellopsis villosa BRADY, Voyage of H. M. S. *Challenger*, Zool., vol. 8, pt. 23, Copepoda, p. 86, pl. 34, figs. 10–13; pl. 35, figs. 14–20, 1883.

Stations 31; 3932; 4952; 5228. This species was the type of Brady's new genus *Pontellopsis* from the *Challenger* plankton, and since the genus has proved to be a valid one it seems strange that Brady did not place Dana's species *strenua* in it instead of in *Pontella.* It appears in all the subsequent plankton lists. T. Scott (1894, p. 87) also found it in 21 tow nettings from the Gulf of Guinea, all but one taken at the surface and Giesbrecht (1892, p. 486) reported the species from the Gulf of Naples. The *Albatross* specimens were males taken in surface tows in the tropical Pacific.

Genus PONTOPTILUS Sars 1905

PONTOPTILUS MUTICUS Sars

Pontoptilus muticus SARS, Bull. Mus. Océanogr. Monaco, No. 40, p. 19, 1905b; Rés. camp. sci. Albert de Monaco, No. 69, p. 312, pl. 110, 1925.

Station 4683. A single female identified by Sars from this station between Callao, Peru, and Easter Island is the first record from the Pacific Ocean. The species was established by Sars upon another single female from the Canary Islands. Together with a third female found by Farran (1908, p. 81) off the west coast of Ireland, these are all the specimens that have thus far been found.

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Genus PSEUDANTHESSIUS Claus, 1889

PSEUDANTHESSIUS PACIFICUS, new species

PLATE 32, FIGURES 481–488

Station 5223. Four females and five males were taken in the surface plankton at this station off the island of Luzón in the Philippines.

Female.—Metasome obovate, narrowed considerably posteriorly and without lateral spaces between the segments, the greatest width across the posterior margin of the fused head and first segment. Second, third, fourth, and fifth segments diminishing in length and width backward. Urosome more than a third as long and less than a half as wide as the metasome and tapered posteriorly. Genital segment as long as the first two abdominal segments combined; anal segment twice as long as the penultimate segment and invaginated on its posterior margin. Caudal rami nearly three times as long as wide, each with five setae, the outer one at the center of the outer margin, the others terminal.

First antennae 7-segmented, the segments with the following relative lengths: 19, 20, 8, 6, 9, 7, 7, all very setose on the anterior margin and the end segment bifurcate at its tip. Second antenna uniramose and 4-segmented, the first segment considerably swollen at its base, the second segment as long as the first and with a short process on the outer margin and a slender spine on the inner margin. The third segment is the shortest of the four, with a process and two setae on its inner margin. The fourth segment has a slender curved claw at its tip, a long seta at the anterior distal corner, and two small setae at the base of the claw. The mandible passes apically into a long spine toothed on both margins, and the palp is a simple fingerlike process with two end setae and two on the inner margin. The second maxilla has a stout basal segment and a much smaller end segment tipped with a curved and dentate spine. The maxilliped is 2-segmented, the end segment ovoid and tipped with two curved spines. In the first three pairs of legs the outer spines of the exopods are short, ovate, and serrate, while the setae are long and densely plumose. In the fourth legs the outer spines of the exopods are slender and aciculate, with a very short spine on each side at the base. The 1-segmented endopod is a flat lamina increasing in width distally, three times as long as its greatest width and tipped with two plumose setae as long as the leg itself. The fifth legs each consist of a long narrow lamina, slightly curved, and tipped with two plumose setae, the inner one as long as the leg itself. Total length 3.25 mm. Greatest width 1.20 mm.

Male.—Metasome elliptical, evenly and broadly rounded at each end and about three-fifths longer than wide. Urosome, including the caudal rami, more than two-thirds as long as the metasome and 5-segmented. Genital segment nearly half as wide as the metasome

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and as long as the abdomen, with two small spines at each posterior corner. The four abdominal segments the same width and the first three about the same length, the anal segment longer, with a posterior sinus for two-thirds of its length. Caudal rami as long as the anal segment, three times as long as wide, the outer seta at the center of the outer margin.

Antennae, mouth parts (except the second maxillae and the maxillipeds), and swimming legs like those of the female. The second maxilla is shown in figure 485; the basal segment has a rounded protuberance on the inner margin at the distal end. The second segment is terminated by a sickle-shaped process whose convex margin is fringed with a row of spines, diminishing in size outwardly. Inside the base of this process are two long slender spines half as long as the process and blunt at their tips. The maxilliped (fig. 486) is made up of two stout basal segments and a slender terminal claw nearly as long as the two segments combined, curved but little, and blunt at its tip. Along the ventral surface of the second segment is an irregular row of small saw teeth, and the inner surface of the segment is hollowed out and armed with two spines. Total length, without caudal rami, 3 mm. Greatest width 1 mm.

Types.—U.S.N.M. No. 74145; station 5223, latitude 13°36′ N., longitude 121°25′30″ E., off Santa Cruz, Philippine Islands.

Remarks.—This species is smaller than Thompson and Scott's *maximus*, and, as shown in the above description, there are specific differences in nearly every one of the appendages.

Genus PSEUDEUCHAETA Sars, 1905

PSEUDEUCHAETA BREVICAUDA Sars

Pseudeuchaeta brevicauda Sars, Bull. Mus. Océanogr. Monaco, No. 26, p. 18, 1905a; Rés. camp. sci. Albert de Monaco, No. 69, p. 102, pl. 29, figs. 1–12, 1925.

Stations 2861; 4679; 4687; 4715. Identified by Sars from the last three *Albatross* stations and from 20 Monaco stations. The female was fully described and figured in the Monaco plankton; the male remains unknown. The original type specimens came from the Bay of Biscay. The present specimens are the first to be reported since then, as well as the first from the Pacific Ocean.

Genus PSEUDOCALANUS Boeck, 1872

PSEUDOCALANUS MINUTUS (Krøyer)

Calanus minutus Krøyer, Naturh. Tidsskr. Kjøbenhavn, ser. 2, vol. 2, p. 543, 1848.

Stations 4; 8; 10; 11; 13–16; 20–25; 29; 33–36; 41; 46; 52; 53; 55; 59–62; 64; 66; 68; 70; 71; 73; 76; 3681; 3705; 3789; 3799; 3800;

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3829; 3834; 3867; 3878; 3901; 4010; 4037; 4190; 4667; 4756; 4758; 4760; 4806; 5030; 5102; 5120; 5129; 5133; 5155; 5180; 5185; 5186; 5190; 5208; 5209; 5211; 5219; 5223; 5225; 5226; 5231; 5232; 5234; 5262; 5263; 5301; 5309; 5320; 5338; 5340; 5341; 5342; 5349; 5381; 5399; 5412; 5414; 5415; 5423; 5424; 5434; 5437; 5507; 5530; 5651; Sabtán Island, Philippine Islands; Fiji Islands; Charles Island, Galápagos; Yes Bay, Alaska.

This well-known species is very widely distributed. It appears in the Monaco and *Carnegie* planktons but strangely was not included in the *Siboga* list. Until recently it bore the specific name *elongatus* ascribed to it by Boeck (1865, p. 234), but the name *minutus* had been given 20 years earlier.

Genus PSEUDOCHIRELLA Sars, 1920

PSEUDOCHIRELLA DIVARICATA (Sars)

Gaidius divaricata Sars, Bull. Mus. Océanogr. Monaco, No. 26, p. 10, 1905a.
Pseudochirella divaricata Sars, Rés. camp. sci. Albert de Monaco, No. 69, p. 91, pl. 25, figs. 5–7, 1925.

Station 5129. Established by Sars in the Monaco plankton upon specimens from the northern Atlantic, and appearing in the *Carnegie* plankton from the Pacific.

PSEUDOCHIRELLA OBTUSA (Sars)

Undeuchaeta obtusa Sars, Bull. Mus. Océanogr. Monaco, No. 26, p. 13, 1905a.
Pseudochirella obtusa Sars, Rés. camp. sci. Albert de Monaco, No. 69, p. 83, pl. 24, figs. 1–4, 1925.

Stations 16; 4679; 4687; 5120; H. 3789. Identified by Sars from the first three of these *Albatross* stations and from 43 Monaco stations, but not appearing in the other planktons. With (1915, p. 147) reported four females collected by the Danish *Ingolf* Expedition in the northern Atlantic. The first Pacific record was that of Sewell (1929, p. 131) who collected the female in the Indian Ocean.

PSEUDOCHIRELLA SCOPULARIS (Sars)

Undeuchaeta scopularis Sars, Bull. Mus. Océanogr. Monaco, No. 26, p. 14, 1905a.
Pseudochirella scopularis Sars, Rés. camp. sci. Albert de Monaco, p. 90, pl. 25, figs. 1–4, 1925.

Stations 4687; 5320. Identified by Sars from the first of these two *Albatross* stations and from two Monaco stations; not appearing in the other planktons. At the first of the *Albatross* stations the tow was one of the few taken vertically from considerable depths, in this case from 2,000 fathoms to the surface.

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Genus PSEUDOPHAENNA Claus, 1863

PSEUDOPHAENNA TYPICA Sars

Pseudophaenna typica SARS, Crustacea of Norway, vol. 4, p. 44, pls. 29, 30, 1902.

Station 3602. Established by Sars upon specimens from the coast of Norway and not appearing in any plankton list. This discovery in the Bering Sea is its first appearance away from the Norwegian coast. Sars regarded this species as a true bottom form in 20 to 50 fathoms, but at this station it was taken at or near the surface.

Genus RATANIA Giesbrecht, 1892

RATANIA FLAVA Giesbrecht

Ratania flava GIESBRECHT, Fauna und Flora des Golfes von Neapel, monogr. 19, p. 616, pl. 5, fig. 6; pl. 48, figs. 40–49, 1892.

Station 5263. [A lot of 10 specimens (U.S.N.M. No. 74107), including both sexes, was identified by Dr. Wilson from this Philippine station. He noted the occurrence in his list of species by stations but failed to mention it in his text. This appears to be the first time the species has been seen since originally described and the first record of it from the Pacific.—W. L. S.]

Genus RHINCALANUS Dana, 1853

RHINCALANUS CORNUTUS Dana

Rhincalanus cornutus DANA, United States Exploring Expedition, 1838–42 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1083, 1853; pl. 76, figs. 2 a–d, 1855.

Stations 16; 27; 48; 63; 66; 75; 2236; 3765; 4605; 4613; 4630; 4638; 4646; 4650; 4664; 4681; 4700; 4703; 4705–4707; 4709; 4710; 4712; 4713; 4715–4719; 4721; 4722; 4724; 4728; 4730; 4734; 4738; 4740; 4926; 5120; 5125; 5126; 5129; 5133; 5134; 5180; 5185; 5186; 5190; 5225; 5227; 5228; 5233; 5240; 5246; 5263; 5287; 5320; 5358; 5422; 5437; 5451; 5553; 5611. In addition to being present at so many *Albatross* stations, this species was reported from several *Challenger*, 24 Monaco, 45 *Siboga*, and 14 *Carnegie* localities. Dana reported four or five individuals from the Atlantic (*op. cit.*, p. 1084). Besides being cosmopolitan in its distribution, it often swarms in large numbers.

RHINCALANUS NASUTUS Giesbrecht

Rhincalanus nasutus GIESBRECHT, Atti. Accad. Lincei, Rome, ser. 4, vol. 4, sem. 2, p. 334, 1888; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 152, 160, pl. 3, fig. 6; pl. 9, figs. 6, 14; pl. 12, figs. 9–12, 14, 16, 17; pl. 35, figs. 46, 47, 49, 1892.

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Stations 64; 65; 75–78; 3382; 3712; 3716; 4533; 4538; 4574; 4580; 4585; 4613; 4632; 4637; 4638; 4646; 4650; 4652; 4655; 4700; 4713; 4715; 4716; 4753; 5120; 5126; 5129; 5134; 5180; 5185; 5186; 5190; 5223; 5225; 5227–5229; 5231; 5233; 5234; 5287; 5489; 5611. Not quite so widely distributed in the *Albatross* plankton as the preceding species, yet reported from 16 *Siboga*, 59 Monaco, and 16 *Carnegie* stations. By comparing the lists it will be seen that the two species are found together oftener than apart, but rarely in the same abundance.

Genus ROBERTSONIA Brady, 1880

ROBERTSONIA TENUIS Brady

Ectinosoma tenuis Brady and Robertson, Rep. 45th Meeting British Assoc. Advancement of Science, p. 196, 1876. (*Nomen nudum.*)
Robertsonia tenuis Brady, Monograph of British Copepoda, vol. 2, p. 25, pl. 41, figs. 1–14, 1880.

Station anchorage at Kodiak, Alaska. Established by Brady for the British Isles but not appearing in any of the plankton lists. It is not a pelagic harpacticoid, but frequents the bottom along the shore and so would rarely be captured except at an anchorage. Both sexes were fully described and figured by Sars (1909, p. 334), who reported the species from various localities on the coasts of Norway and from the Arctic Ocean.

Genus SAPPHIRINA J. V. Thompson, 1830

SAPPHIRINA ANGUSTA Dana

Sapphirina angusta Dana, Proc. Amer. Acad. Arts and Sci., vol. 2, p. 41, 1849; United States Exploring Expedition, 1838–42 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1240, 1853; pl. 87, fig. 3 a, b, 1855.

Stations 27; 77; 2937; 3799; 3829; 3901; 4926; 5126; 5190; 5196; 5209; 5227; 5231; 5234; 5263; 5319; 5348; 5415; 5422; 5646. Founded by Dana upon specimens from the southern Pacific and present in all the plankton lists, but nowhere abundant.

SAPPHIRINA AURONITENS Claus

Saphirina auronitens Claus, Die freilebenden Copepoden, p. 153, 1863.

Stations 15; 27; 30; 39; 41; 44; 49; 54; 55; 58–60; 62–66; 70; 71; 73; 77; 78; 2806; 3799; 3829; 3834; 3901; 3912; 3932; 4010; 4037; 4190; 4952; 5120; 5134; 5180; 5185; 5186; 5190; 5196; 5223–5225; 5227; 5234; 5240; 5263; 5287; 5301; 5308; 5319; 5334; 5338; 5386; 5415; 5424; 5434; 5437; 5530; 5601; Sabtán Island and Iloilo Straits, Philippine Islands; Fiji Islands; Gilbert Island; Niuafu Island. This species was reported from 8 *Siboga*, 8 Monaco, and 72 *Carnegie* stations. It fre-

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quents the surface when swimming about freely and so is oftenest taken in surface tows.

SAPPHIRINA BICUSPIDATA Giesbrecht

Sapphirina bicuspidata GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 7, sem. 1, p. 479, 1891; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 619, 642, pl. 52, figs. 39–41; pl. 53, figs. 9,37, 54; pl. 54, figs. 5, 30, 66, 1892.

Stations 3901; 5223. A single female was present in the plankton at station 3901 in the Hawaiian Islands. Several females were taken at station 5223 off Santa Cruz, Philippine Islands. The species was reported from 12 stations in the *Siboga* plankton. It has also been found by Farran (1929, p. 289) in the tropical Atlantic and has been recorded from the Indian Ocean (Thompson and Scott, 1903, p. 287), the Mediterranean (Giesbrecht, 1892, p. 619), and the Red Sea (Steuer, 1898, p. 425). In spite of this wide distribution, not more than one or two specimens have been taken from any one locality.

SAPPHIRINA GEMMA Dana

Sapphirina gemma DANA, Proc. Amer. Acad. Arts and Sci., vol. 2, p. 44, 1849; United States Exploring Expedition, 1838–42 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1252, 1853; pl. 88, figs. 1 a–f, 2 a–g, 1855.

Station 3878. Established by Dana upon specimens from the coast of New Zealand and reported in the Monaco and *Challenger* planktons.

SAPPHIRINA INTESTINATA Giesbrecht

Sapphirina intestinata GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 7, sem. 1, p. 478, 1891; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 619, 643, pl. 52, figs. 10, 11, 36; pl. 53, figs. 11, 47, 51; pl. 54, figs. 7, 29, 62, 1892.

Stations 71; 4761. Founded by Giesbrecht upon specimens from the tropical Pacific north of the Equator; also recorded from the tropical Pacific in the *Siboga* plankton. The second of these *Albatross* stations is just south of the Shumagin Islands of Alaska. This is very far north for the genus, but within the influence of the Japan Current, which can transport species to the north just as the Gulf Stream does in the northern Atlantic.

SAPPHIRINA IRIS Dana

Sapphirina iris DANA, Proc. Amer. Acad. Arts and Sci., vol. 2, p. 41, 1849; United States Exploring Expedition, 1838–42 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1239, 1853; pl. 87, figs. 1 a–c, 2 a–d, 1855.

Stations 4619; 5155. Four females were captured at station 4619 off the southwest coast of Panama; a fifth at station 5155 in the Philippines. The species appears both in the *Challenger* plankton (*gemma*,

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pars) and the Monaco plankton (Rose). It has also been reported by Esterly (1905, p. 219) off the coast of southern California. Dana's original types came from the southern Pacific from within the cavity of a *Salpa*, one of the few instances in which specimens of this genus have been taken actually inside such a host.

SAPPHIRINA LACTENS Giesbrecht

PLATE 33, FIGURE 504

Sapphirina lactens GIESBRECHT, Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 619, 641, pl. 52, figs. 15, 16, 30; pl. 53, figs. 1, 27, 44, 1892.

Stations 25; 54; 78; 2396. A single female was obtained in the plankton at each station. It is not present in any of the plankton lists but was founded upon specimens from Naples and has been recorded in the Adriatic plankton by various authors. This is the first record outside of the Adriatic and shows that the same species may be found also in the western Atlantic.

SAPPHIRINA LONGIFURCA A. Scott

PLATE 32, FIGURES 490–493

Sapphirina longifurca A. SCOTT, Copepoda of the *Siboga* Expedition, monogr. 29a, pt. 1, p. 259, pl. 68, figs. 15–20, 1909.

Stations 5232; 5553; 5578; 5640. Established by Scott upon a single female from Molucca Strait off Ternate Island. The present specimens constitute the first record since the original discovery. Eight specimens including a male were captured at these *Albatross* stations among the Philippine Islands. Since the females differ in minor details from Scott's description and the male appears for the first time, a full description of both sexes is given. A typical female and the male allotype have been given U.S.N.M. No. 74146.

Female.—General form elongate and narrow, more than four times as long as wide including the caudal rami. Metasome about the same width throughout, the third and fourth segments with pointed posterior corners. The fifth segment is shorter than the others but extends outward on each side in a rounded process tipped with two setae, so that it is nearly as wide as the rest of the thorax. Urosome a little more than half as wide and, including the caudal rami, seven-tenths as long as the metasome and 5-segmented. The first four segments are about equal in length and in width; the anal segment is three-fourths as wide and twice as long, with nearly straight sides and reentrant at the center of the posterior margin, where on the dorsal surface are two dorsal plates, each with a central dark spot. Caudal rami four times as long as wide and tapered posteriorly, each with a nearly straight outer margin broken twice for the attachment of the

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outer setae. The inner margin is broadly curved and has a small tooth near the tip opposite the distal outer seta and the tip itself has two terminal setae. There is also an appendicular seta on the dorsal surface of each ramus a little beyond the center.

The first antennae are short and stout and 5-segmented, each segment rather setose; the second antennae are 4-segmented and tipped with a stout claw. The maxilliped is 3-segmented, with a short and stout terminal claw, and the legs show no distinctive specific characters. Total length including caudal rami 5.50 mm. Width of metasome 1.33 mm.

Male.—General form short and broad, less than three times as long as wide including the caudal rami. Metasome widest at the third segment and narrowed posteriorly, the segments diminishing in length backward. Urosome narrower than the metasome and, without the caudal rami, less than half as long and made up of five segments. The anal segment is less than half the width of the penultimate segment and shows a pair of anal plates similar to those in the female, each with a dark spot in the center. Caudal rami also similar to those in the female but only three times as long as wide, with two terminal and two outer setae and a tooth near the tip of the inner margin. Antennae, mouth parts, and legs similar to those of the female. While the females are of a brownish color and opaque, the male, as is usual in this genus, is more or less transparent and is covered up and down the center of the body with circular black spots irregularly arranged and of different sizes. This spotting is fully as conspicuous and as deep a black as in *nigromaculata;* the position of the posterior pair of spots is shown in figure 493. Total length, including caudal rami, 6 mm. Greatest width 2 mm.

Allotype male.—U.S.N.M. No. 74146; station 5578, latitude 5°14′38″ N., longitude 119°57′57″ E., north of Tawi Tawi, Philippine Islands.

Remarks.—There are two differences between these *Albatross* specimens and the single female described by Scott. The eye lenses are in contact on the middle of the forehead, and the outer margins of the caudal rami are armed with setae.

SAPPHIRINA METALLINA Dana

Sapphirina metallina Dana, Proc. Amer. Acad. Arts and Sci., vol. 2, p. 41, 1849; United States Exploring Expedition, 1838–42 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1242, 1853; pl. 87, figs. 5 a–c, 1855.

Stations 3681; 3782; 3799; 3878; 3901; 3932; 4009; 4190; 4655; 4699; 4721; 5102; 5129; 5155; 5185; 5223; 5229; 5422; 5553; Gilbert Islands. Established by Dana upon specimens from these same Gilbert Islands. This species is so well distributed that it is present in all the plankton lists.

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SAPPHIRINA NIGROMACULATA Claus

Saphirina nigromaculata CLAUS, Die freilebenden Copepoden, p. 152, pl. 8, figs. 5, 6, 1863.

Stations 1; 15; 3799; 3901; 4009; 4190; 4588; 4609; 4611; 4644; 4663; 4700; 4713; 4717; 4733; 5129; 5155; 5185; 5186; 5190; 5196; 5223; 5225; 5227; 5231; 5233; 5246; 5263; 5319; 5320; 5348; 5424; 5437; 5530; Niuafu Island. This species is found in all the plankton lists except that of the Wilkes and *Challenger* and sometimes is quite abundant.

SAPPHIRINA OPALINA Dana

Sapphirina opalina DANA, Proc. Amer. Acad. Arts and Sci., vol. 2, p. 45, 1849; United States Exploring Expedition, 1838–42 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1254, 1853; pl. 88, fig. 4 a–l, 1855.

Stations 15; 27; 49; 2396; 3781; 3799; 3867; 4190; 4611; 4655; 4663; 4671; 4707; 4731; 5102; 5105; 5129; 5133; 5134; 5180; 5185; 5225; 5227; 5231; 5233; 5319; 5348; 5456. Dana's types came from the Atlantic, but the species has since been reported from all the oceans. Although appearing in all the plankton lists, only one or two specimens have been recorded from any one locality.

SAPPHIRINA OVATO-LANCEOLATA Dana

Sapphirina ovato-lanceolata DANA, Proc. Amer. Acad. Arts and Sci., vol. 2, p. 44, 1849; United States Exploring Expedition, 1838–42 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1251, 1853; pl. 87, figs. 15 a–c, 16 a, b, 1855.

Stations 3829; 3878; 4926; 5126; 5208; 5231. Established by Dana upon specimens from the Atlantic off Rio de Janeiro; reported by Scott in the *Siboga* plankton from 22 stations in the Malay Archipelago, and confined to two localities in the tropical Pacific in the *Carnegie* plankton.

SAPPHIRINA PYROSOMATIS Giesbrecht

Sapphirina pyrosomatis GIESBRECHT, Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 619, 641, pl. 52, figs. 12–14, 17; pl. 53, figs. 8, 41, 53; pl. 54, figs. 21, 38, 58, 1892.

Station 14. A single female was obtained in a surface tow at this station east of Patagonia. The species was originally based upon specimens from the Bay of Naples. Rose reported it from 10 stations in the Monaco plankton, all in the Atlantic and Farran (1929, p. 289) also recorded it from the northern Atlantic in the *Terra Nova* plankton. The first Pacific record was in the *Carnegie* plankton.

SAPPHIRINA SALI Farran

Sapphirina sali FARRAN, British Antarctic (*Terra Nova*) Exped., 1910, Zool., vol. 8, No. 3, p. 287, fig. 34, 1929.

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Stations 4653; 4731; 5196. Established by Farran in the *Terra Nova* plankton from 9 stations off New Zealand and not found in any of the plankton lists.

SAPPHIRINA SALPAE Claus

Sapphirina salpae CLAUS, Arch. für Anat., Physiol. und wiss. Med., 1859, p. 270, pl. 5B, fig. 1.

Stations 3799; 5102; 5230; 5263; 5386; 5488; Gilbert Islands. Established by Claus upon specimens from Nice in southern France; not appearing in any of the plankton lists. It was reported, however, by Farran (1929, p. 287) as frequent off New Zealand, by Wolfenden (1911, p. 361) from the northern and southern Atlantic, and by Brady (as *S. gemma*) in the *Challenger* plankton from the Philippine Islands.

SAPPHIRINA SCARLATA Giesbrecht

Sapphirina scarlata GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 7, sem. 1, p. 478, 1891; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 620, 642, pl. 52, figs. 42, 60, 61; pl. 53, figs. 12, 39, 62; pl. 54, figs. 25, 31, 72, 1892.

Stations 3789; 3799; 4663; 5185; 5263; 5488. Established by Giesbrecht upon specimens from northeast of the Galápagos Islands, present at 3 stations in the *Siboga* plankton and at 5 in the *Carnegie*. Also reported by Farran (1929, p. 289) off New Zealand, and by Esterly (1905, p. 222) off the coast of southern California.

SAPPHIRINA STELLATA Giesbrecht

Sapphirina stellata GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 7, sem. 1, p. 478, 1891; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 620, 643, pl. 52, figs. 7–9; pl. 53, figs. 15, 35, 59; pl. 54, figs. 22, 27, 69, 1892.

Stations 3932; 4700; 5223; 5240; 5319; Gilbert Islands. Established by Giesbrecht upon specimens from the tropical Pacific. Reported by Rose from 3 Monaco stations, by Scott from 30 *Siboga* stations, and found at 8 *Carnegie* stations. Scott made it the commonest and most widely distributed species of the genus in the *Siboga* plankton, but it stood at the other distributional extreme here in the *Albatross* plankton.

Genus SCAPHOCALANUS Sars, 1900

SCAPHOCALANUS AFFINIS (Sars)

PLATE 17, FIGURES 220–221; PLATE 33, FIGURE 503

Amallophora affinis SARS, Bull. Mus. Océanogr. Monaco, No. 26, p. 21, 1905a.
Scaphocalanus affinis SARS, Rés. camp. sci. Albert de Monaco, No. 69, p. 171, pl. 48, figs. 15–23, 1925.

Stations 13; 4634; 4661; 4665; 4667; 4671; 4679; 4719; 4722; 4725; 4740; 5120; 5185; 5233. Identified by Sars from the first 11 of these

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Albatross stations and from 34 Monaco stations; reported by Farran (1929, p. 248) from the Antarctic in two deep hauls, 1,000 and 1,750 fathoms; and from the Indian Ocean by Sewell (1929, p. 205). Both sexes are fully described in the Monaco report.

SCAPHOCALANUS ANGULIFRONS Sars

PLATE 33, FIGURES 505, 506

Scaphocalanus angulifrons SARS, Bull. Institut Océanogr. Monaco, No. 377, p. 8, 1920; Rés. camp. sci. Albert de Monaco, No. 69, p. 170, pl. 48, figs. 1–14, 1925.

Station 5185. Twenty-two females and one male were obtained at this station between Panay and Negros, Philippine Islands, in a tow at a depth of 550 fathoms. The species was founded upon a single female from the temperate Atlantic, and the *Albatross* specimens are the first taken since that time. The female was fully described and figured in the Monaco plankton; the description of the new male here given completes the diagnosis of the species and substantiates its validity.

Male.—Metasome elongate-elliptical, considerably narrowed at both ends; head fused with the first segment and provided with a crest as well defined as in the female. Fourth and fifth segments separated, the latter produced into small round knobs on each side of the genital segment. Urosome two-fifths as long and a quarter as wide as the metasome and 5-segmented, the segments diminishing in length and width backward, anal segment very short. Caudal rami almost circular in dorsal outline and about twice as long as the anal segment, the five setae attached around two-thirds of the circle.

The first antennae are very slender and reach the distal end of the first abdominal segment. The exopod of the seond antenna is but little longer than the endopod, and its second segment is one-half longer than the end segment, with very long and slender setae. Mouth parts like those of the female. Endopods of the first three pairs of legs with rows of spines on the ventral surface, but no spines on the fourth endopod. Fifth legs of the same general form as in *affinis* but differing in details. The endopod of the right fifth leg is laminate and reaches the middle of the second segment of the exopod, with a rounded barb on the ventral margin. The first segment of the exopod is enlarged at the distal end and projects beyond the attachment of the second segment as an angular process. The second segment is also enlarged at the distal end on the inner margin, while the third segment is straight and spiniform. The second basipod of the left leg is longer than the first and reaches the center of the first exopod segment of the right leg. The two rami of this leg are subequal, one ending in an ovate knob, the other in a laminate seta. Total length 5.11 mm. Metsome 3.69 mm. long, 1.50 mm. wide.

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Allotype male.—U.S.N.M. No. 74147, described by Dr. Wilson, but cannot now be found in the collection which he returned to the National Museum.

SCAPHOCALANUS BREVICORNIS (Sars)

PLATE 33, FIGURES 507–509

Scolecithrix brevicornis SARS, Norwegian North Polar Exped., vol. 5, Crustacea, p. 46, pl. 10, 1900.

Station 5185. Founded by Sars upon a few female specimens taken north of latitude 81° during the Norwegian North Polar Expedition and placed in the genus *Scolecithrix*. Found in the Polar Ocean between Spitsbergen and Greenland by With (1915, p. 192) and transferred to the present genus. Reported in the Antarctic by Farran (1929, p. 248) and kept in the present genus, where it evidently belongs. Not in any of the plankton lists. A single male and female were taken in a tow at this *Albatross* station at a depth of 550 fathoms. Camera-lucida drawings of the fifth legs of each sex are here presented and leave no doubt of the identity of the species, and a dorsal view of the male is included since none has ever appeared. U.S.N.M. No. 74148.

SCAPHOCALANUS ECHINATUS (Farran)

PLATE 34, FIGURES 510–511

Scolecithrix echinata FARRAN, Ann. Rep. Fisheries Ireland, 1902–3, pt. 2, app. 2, p. 37, pl. 4, figs. 15–18; pl. 5, figs. 12–17, 1905.

Stations 3799; 4758; 5231; 5263. Established by Farran upon a few female specimens captured off the coast of Ireland; later reported off New Zealand (Farran, 1929, p. 250). Evidently no male was found at either time although such a statement was not made. The plankton from station 3799 in the Hawaiian Islands, however, yielded a male and two females, and the former is here described for the first time.

Female.—Head smoothly rounded in front, without a crest, fourth and fifth segments fused with rounded posterior corners. Urosome one-fourth as long and one-fifth as wide as the metasome and 4-segmented, the three abdominal segments equal in length and width. Caudal rami as wide as long, well separated, and somewhat divergent. The first antennae reaching the center of the last segment of the metasome. The fifth legs 2-segmented, the end segment with a long smooth terminal seta, a coarsely toothed inner seta, and a small tooth on the outer margin opposite the base of the inner seta. Total length 2 to 2.4 mm.

Male.—Metasome elongate elliptical, three times as long as wide; head broadly rounded and without a crest; fourth and fifth segments fused with rounded corners. Urosome almost a third as long and a

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fourth as wide as the metasome and caudal rami as wide as long. The first antennae reach the genital segment, and neither of them is geniculate. The outer spines of the first and second segments of the second exopod are about equal, as in the female. The fifth legs are equal in length; the second basipod of the right leg is enlarged into a sphere almost four times the diameter of the first basipod. The endopod is styliform and 1-segmented, the exopod is slender and 3-segmented, and the endopod reaches only to the center of the first segment of the exopod. The two basipod segments of the left leg are slender and cylindrical and reach nearly to the center of the second segment of the right exopod. The two rami are 3-segmented and equal in length, the first two segments cylindrical, the end segment shaped like an hourglass and sharply bent at the constriction. Total length 1.80 mm. Metasome 1.35 mm. long, 0.45 mm. wide.

Allotype male.—U.S.N.M. No. 74149; station 3799, latitude 29°22′ N., longitude 139°31′ W., Hawaiian Islands.

Remarks.—The fifth legs of this *Albatross* male are as distinctive as those of the female and complete the species diagnosis.

SCAPHOCALANUS INSOLITUS, new species

PLATE 34, FIGURES 512–514

Stations 5105, 5231. Two females were found in the plankton at Station 5231, between Bohol and Leyte Islands in the Philippines. Additional specimens were taken also in the surface tow made at Station 5105 off southern Luzón.

Female.—Metasome elongate-elliptical, nearly three times as long as wide and considerably narrowed at both ends. Head fused with the first segment and the resultant cephalothorax more than twice as long as the rest of the metasome, with a very pronounced triangular crest on the forehead. Fourth and fifth segments also fused and prolonged backward at the posterior corners nearly to the distal end of the genital segment. Urosome less than a third as long and a fourth as wide as the metasome and 4-segmented, the segments all about the same width. The genital segment is as long as the first abdominal segment, while the second and third abdominal segments diminish in length. Caudal rami as long as the anal segment, one-half longer than wide and divergent.

First antennae reaching the caudal rami; exopod of the second pair slightly longer than the endopod, the second segment longer than the end segment and all the setae exceptionally long and slender. Fifth legs very unusual, as shown in figure 514, giving rise to the specific name. Each is 3-segmented, the two basal segments wider than long, the terminal segment much reduced in width and tipped with a small spine at each distal corner and two still smaller ones between them.

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At the inner distal corner of the second segment is a huge spine perfectly smooth and nearly as long as the entire leg. The two spines are slightly curved and project so obliquely inward that their tips almost meet on the midline. Total length 3.80 mm. Metasome 3 mm. long, 1 mm. wide.

Types.—U.S.N.M. No. 74150; station 5231, latitude 10°01′15″ N., longitude 124°43′15″ E., between Bohol and Leyte, Philippine Islands.

Remarks.—This species may be readily recognized by its triangular crest, which comes to a point in front when viewed laterally, and by the unique details of the fifth legs, the huge spines being visible without removing the legs.

SCAPHOCALANUS MAGNUS (T. Scott)

Amallophora magna T. Scott, Trans. Linn. Soc. London, ser. 2, Zool., vol. 6, pt. 1, p. 55, pl. 4, figs. 5–9, 1894.

Stations 2; 2219; 4646; 4655; 4663; 4665; 4681; 4711; 4715; 4716; 4717; 4719; 4793; 5120; 5129; 5185; 5231; 5320. Identified by Sars from 10 of these *Albatross* stations and from 7 Monaco stations; also reported from 9 *Siboga* stations and the *Carnegie* plankton. In the preliminary Monaco list Sars (1905a, p. 6) placed this species in the genus *Amallophora*, transferring it to the present genus in the final Monaco report (1925).

SCAPHOCALANUS MEDIUS (Sars)

Plate 34, Figures 515–517

Amallophora media Sars, Bull. Inst. Océanogr. Monaco, No. 101, p. 16, 1907.
Scaphocalanus medius Sars, Rés. camp. sci. Albert de Monaco, No. 69, p. 173, pl. 44, figs. 1–8, 1925.

Stations 4679; 4717; 5120; 5230. Established by Sars upon a few females taken in the Atlantic south of the Azores; appearing in the *Carnegie* plankton and listed by Sewell (1929, p. 208). Five females are listed from the first two stations in the eastern tropical Pacific and twenty specimens, representing both sexes, at the last two stations in the Philippines. Since the male is the first of its sex to be found, it is here described and figured.

Female.—Metasome elliptical, head fused with the first segment and smoothly rounded in front without any crest, fourth and fifth segments also fused with rounded corners, which barely overlap the anterior margin of the genital segment. Urosome one-third as long and one-fourth as wide as the metasome, 4-segmented. First antennae reach the center of the last metasome segment. The fifth legs are 2-segmented, the end segment with a long inner seta plumed only on the

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outside, a shorter terminal seta and a still shorter outer seta. Length 2 to 2.4 mm.

Male.—Metasome elliptical, a little more than twice as long as wide and scarcely narrowed at each end. Head fused with the first segment and broadly rounded and without a crest; fourth and fifth segments also fused, the rounded posterior corners not quite reaching the genital segment. Urosome nearly half as long as the metasome and a fourth as wide, 5-segmented, the segments diminishing in length distally, the anal segment very short. Genital segment nearly as long as the first two abdominal segments combined and partially divided at its center. Caudal rami twice as long as wide and slightly divergent.

First antennae reaching the center of the genital segment, rather stout at the base but rapidly becoming slender with short setae. Exopod of second antennae one-half longer than the endopod; mouth parts and first four pairs of legs like those of the female. Fifth legs similar to those of the *affinis* male but with the following differences: The endopod of the right leg is much shorter than the basal segment of the exopod and acuminate. The basal segment of the exopod is swollen proximally and produced inward at its tip into a blunt process, and the end segment is less than half as long as the middle segment. The rami of the left leg are approximately the same width, and the inner one is but little longer than the outer.

Total length 1.82 mm. Metasome 1.20 mm. long, 0.53 mm. wide.

Allotype male.—U.S.N.M. No. 74151; station 5230, latitude 10°01′50″ N., longitude 124°42′30″ E., between Bohol and Leyte, Philippine Islands.

Remarks.—This species closely resembles *affinis* but is only three-fifths as large and has no frontal crest. These differences together with the details of the fifth legs in both sexes will identify the species. [Some question has arisen as to the actual identity of at least some of the specimens which Dr. Wilson has identified as *S. medius*, inasmuch as the drawing which he prepared of the fifth legs of the female for this report (pl. 34, fig. 516) is not in agreement with a manuscript sketch by Sars of an *Albatross* specimen for which he did not record the station number. Regrettably, the *Albatross* specimen figured by Wilson seems no longer to be extant. Dissections of a female *S. medius* from the general collections of the National Museum (*Albatross* stations 5120, 5230) identified by Wilson, as well as a typical female so designated by him (*Albatross* station 5230), are unlike Wilson's figure but do correspond closely with Sars' sketch to which reference has been made. It cannot now be ascertained whether the Museum females identified by Wilson as *S. medius* are aberrant, or representa-

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tives of an undescribed species. If the latter alternative is true, the male allotype of *S. medius* diagnosed by Wilson and placed in the same vial with the selected "typical" female may have been incorrectly assigned to this species.—M. S. W.]

SCAPHOCALANUS ROBUSTUS (T. Scott)

PLATE 17, FIGURES 223–226; PLATE 18, FIGURES 227–229

Amallophora robusta T. SCOTT, Trans. Linn. Soc. London, ser. 2, Zool., vol. 6, pt. 1, p. 56, pl. 4, figs. 24–29, 1894.

Stations 4590; 5231; 5233. Established by Scott upon specimens from the Gulf of Guinea and placed by him in the genus *Amallophora;* transferred to the present genus by With (1915, p. 202) in the Danish *Ingolf* plankton. With, however, acknowledged that his description did not correspond with that given by Scott; moreover his figures were very limited. The *Albatross* specimens agree very closely with those obtained by Scott and for this reason the excellent figures made by Sars are here reproduced together with a supplementary description.

Female.—Metasome moderately robust but not so much so as in Scott's figure, but the urosome is considerably more robust. The head is narrowed but little in front, the forehead is broadly rounded and highly arched in lateral view and without a crest. Fourth and fifth segments fused, the posterior corners broadly rounded and reaching beyond the center of the genital segment, with a very minute spine at the apex. Urosome one-sixth as long and almost a third as wide as the metasome and 4-segmented. The genital segment is as long as the three abdominal segments combined and considerably wider. The caudal rami are wider than long, squarely truncated distally, and divergent.

The first antennae reach beyond the tips of the caudal rami and are sparsely setose. The exopod of the second antenna is twice as long as the endopod and its terminal segment is one-half longer than the second segment. The five lateral lobes of the second maxilla are well developed, and the end segment is tipped with three cylindrical filaments and five shorter ones with ovate heads. There is no trace of the filament with an ovate head on the first segment of the maxilliped mentioned by Scott, but otherwise the armature is exactly the same. The arrangement of the spines upon the third legs is shown in figure 229, and it will be noted that those upon the endopod are long and slender. The fifth legs are 2-segmented with indications that the second segment is really two segments fused. It carries a stout setose spine on the inner margin and a much smaller and smooth terminal spine. Total length 3 mm. Metasome 2.65 mm. long, 1 mm. wide.

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Remarks.—All the specimens thus far obtained have been females; the male still remains unknown. The female can be recognized by its large size, robust form, by the absence of a frontal crest, and by the details of the fifth legs. Scott called attention also to the row of small teeth along the outer margin of the terminal spines of the exopods of the swimming legs. These *Albatross* specimens agree exactly in size with the type specimens described by Scott. The smaller size given by Farran (1929, p. 246) was doubtless due to the fact that his specimens were not fully grown, since he states that half of them were still in stage V.

SCAPHOCALANUS SUBBREVICORNIS (Wolfenden)

PLATE 34, FIGURE 518

Amallophora subbrevicornis WOLFENDEN, Deutsche Südpolar Exped., 1901–03, vol. 12, Zool., vol. 4, fasc. 4, p. 262, fig. 37, a–c, 1911.

Stations 3799; 5233. Established by Wolfenden upon two female specimens in a vertical haul from a depth of 1,200 meters in the Antarctic Ocean and placed in the genus *Amallophora*. Eight females were reported by Farran (1929, p. 249) from two vertical hauls of 400 and 1,000 meters in the Antarctic. The species did not appear in any of the plankton lists, and the foregoing are the only specimens reported since these records were made. The fifth legs of one of the *Albatross* specimens are shown in figure 518, and it can be seen that they correspond with those figured by Wolfenden and Farran except in one particular. At the inner distal corner of the second segment is a short bluntly rounded process that does not appear in the other figures. This may well be the rudiment of an endopod that will disappear later.

Genus SCOLECITHRICELLA Sars, 1902

SCOLECITHRICELLA ABYSSALIS (Giesbrecht)

PLATE 34, FIGURE 519

Scolecithrix abyssalis GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 4, sem. 2, p. 338, 1888; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 266, 284, pl. 13, figs. 15, 40; pl. 37, fig. 7, 1892.

Stations 4652; 5129; 5185; 5190; 5231; 5263; 5320. Established by Giesbrecht upon specimens from the tropical Pacific in vertical hauls from depths of 1,000 to 4,000 meters. Found at eight stations in the *Siboga* plankton, at a single station in the Monaco plankton, and at ten stations in the *Carnegie* plankton; all these tows were vertical hauls from considerable depths. These *Albatross* specimens were also obtained in vertical hauls from depths varying from 65 to 550 fathoms. It seems, therefore, that the specific name of the species is well deserved and that it is not likely to be found at the surface.

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SCOLECITHRICELLA AUROPECTEN (Giesbrecht)

PLATE 19, FIGURE 251; PLATE 34, FIGURES 520–524

Scolecithrix auropecten GIESBRECHT, Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 266, 284, pl. 13, figs. 8, 18, 22, 27; pl. 37, figs. 3, 10, 1892.

Stations 3799; 4011; 4652; 5129; 5180; 5185; 5190; 5229; 5231; 5233; 5240; 5246; 5263; 5320; 5437; 5553. Established by Giesbrecht upon female specimens taken at Naples; reported from the Celebes Sea in the *Siboga* plankton, and from Pacific stations in the *Carnegie* plankton. The first males to be obtained came from these *Albatross* stations and are here described.

Female.—Metasome elongate-elliptical, two and a half times as long as wide; head fused with the first segment, and the fourth with the fifth segment, the posterior corners angular. Urosome 4-segmented, the three abdominal segments of equal length and width, the genital segment longer and wider. First antennae reaching the middle of the third thoracic segment; endopod of second antenna longer and stouter than the exopod. Fifth legs 2-segmented and tipped with two spines, one apical and the other subapical on the inside and longer. Length 1.8 mm.

Male.—Metasome nearly three times as long as wide; head separated from the first segment and broadly rounded. Fourth and fifth segments incompletely fused, with rounded corners overlapping the genital segment. Urosome more than a third as long and as wide as the metasome; 5-segmented. Genital segment wider than long, with nearly straight sides; the first three abdominal segments about the same length and width, the anal segment much shorter. Caudal rami a little longer than wide and parallel, each with five short setae.

First antennae reaching the genital segment, rather slender and sparsely setose, neither of them geniculate. Second antennae, mouth parts, and first four pairs of legs like those of the female. The two fifth legs are unequal in length, the right one considerably the longer and slenderer. It is made up of two basipod segments, a 3-segmented exopod, and a 1-segmented endopod. The left leg has two short basipod segments, neither of which is swollen, a long exopod segment with a knob at its distal end, and a rounded protuberance at the center of the lateral margin. The end segment is more or less laminate, curved, and flanked by a curved claw at its base. Total length 1.48 mm. Metasome 1.06 mm. long, 0.40 mm. wide.

Allotype male.—U.S.N.M. No. 74153; station 5437, latitude 15°45′54″ N., longitude 119°42′45″ E., west coast of Luzón, Philippine Islands.

Remarks.—The males of species in this genus are extremely few in number, and a new one makes a welcome addition to our knowledge of these copepods.

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SCOLECITHRICELLA BRADYI (Giesbrecht)

Scolecithrix bradyi GIESBRECHT, Atti Acad. Lincei, Rome, ser. 4, vol. 4, sem. 2, p. 337, 1888; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 266, 283, pl. 4, fig. 7; pl. 13, figs. 1, 3, 7, 11, 21, 28; pl. 37, figs. 1, 2, 9, 1892.

Stations 3; 51; 77; 78; 470; 3799; 3829; 3834; 3867; 3878; 3932; 3980; 4009; 4037; 4611; 4659; 4673; 4700; 4707; 5120; 5129; 5185; 5190; 5233; 5263; 5319; 5342; 5399; 5412; 5415; 5422; 5437; 5553; Sabtán Island, Philippine Islands. Identified by Sars from 5 of these *Albatross* stations and from 1 Monaco station; found also at 7 *Siboga* and 31 *Carnegie* stations.

SCOLECITHRICELLA DENTATA (Giesbrecht)

PLATE 18, FIGURES 230–232

Scolecithrix dentata GIESBRECHT, Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 266, 283, pl. 13, figs. 12, 20, 33; pl. 37, figs. 13, 14, 1892.

Stations 3; 470; 3799; 4700; 4757; 4758; 5120; 5129; 5185; 5223; 5230; 5246; 5320; 5340. Specimens, including both sexes, were identified from station 4700, between Easter Island and the Galápagos Islands, by Sars, who also recorded the species from three stations in the Monaco plankton. The Monaco specimens were all from the northern Atlantic, so that this is the first record from the Pacific and these are the first males ever taken.

Female.—Metasome elliptical, two and one-third times as long as wide; head fused with the first segment, and the fourth with the fifth segment, corners rounded. Urosome one-fourth as long and one-seventh as wide as the metasome, 4-segmented, segments diminishing in length backward. First antennae not quite reaching the genital segment; exopod of second antenna slightly longer than endopod. Fifth leg laminate ovate, with a tiny spine at the tip and a much larger one at the center of the inner margin. Total length 1.60 mm.

Male.—Fully as large as the female and similar in general form, but the urosome is proportionally longer and 5-segmented, the anal segment shortened and the penultimate segment lengthened, the other three about equal in length.

The first antennae reach the middle of the urosome and the basal segments carry slender aesthetasks in addition to setae. The fifth legs are slender and reach beyond the tips of the caudal rami, and their structure is very different from those of the other males. The second segment of the left basipod is inflated, and the exopod is 2-segmented, the second segment curved and tipped with a flanged spine. The first segment carries at its outer distal corner a blunt rodlike spine. The right leg has two cylindrical basipod segments, which combined almost reach the distal end of the first exopod segment of the left leg. The

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exopod is 3-segmented, the segments diminishing in length and width distally, the end segment tipped with a bunch of setae. The endopod is 1-segmented, much longer than the exopod, swollen in the center, the terminal portion curved into a half circle tipped with an acute process. Total length 1.55 mm. Metasome 1 mm. long, 0.42 mm. wide.

Allotype male.—U.S.N.M. No. 79939 (slide); station 5120, latitude 13°45′30″ N., longitude 120°30′15″ E., west of Lubang, Philippine Islands.

Remarks.—At first glance the male fifth legs described above would seem to warrant generic separation from the other species, but closer examination reveals that they are constructed on the same general plan as those of *auropecten* and *minor*, the differences being confined to details of structure. Since the females are undoubted species of the present genus and the males correspond in the details of the antennae, mouth parts, and first four pairs of legs, it does not appear advisable to try to erect a new genus for them.

SCOLECITHRICELLA MINOR (Brady)

PLATE 34, FIGURE 525

Scolecithrix minor BRADY, Voyage of H. M. S. *Challenger*, Zool., vol. 8, pt. 23, Copepoda, p. 58, pl. 16, figs. 15–16, pl. 18, figs. 1–5, 1883.

Station 4759. Established by Brady in the *Challenger* plankton upon specimens from the southwestern Indian Ocean and placed in the genus *Scolecithrix*. Made the type of a new genus, *Scolecithricella*, by Sars (1902, p. 55); reported from one station in the Monaco plankton, and from both the Atlantic and Pacific in the *Carnegie* plankton.

SCOLECITHRICELLA OVATA (Farran)

PLATE 35, FIGURE 527

Scolecithrix ovata FARRAN, Ann. Rept. Fisheries, Ireland, 1902–03, pt. 2, app. 2, p. 37, pl. 6, figs. 13–18; pl. 7, figs. 1–5, 1905.

Station 2563. Established by Farran upon specimens from the northern Atlantic off the coast of Ireland; a single female was reported by Sars in the Monaco plankton and a few specimens at a northern Atlantic station in the *Carnegie* plankton. Three females were taken at this *Albatross* station off the coast of Delaware; thus the species remains confined to the Atlantic Ocean, and the adult male is unknown. As can be seen from the figure, the fifth legs of the female are peculiar in being 3-segmented and in the relative size and arrangement of the spines.

[What other material Dr. Wilson may have had from this station cannot now be determined. Neither the original sample from which

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the specimens here referred to and figured were taken nor the specimens themselves could be located in the *Albatross* material returned by the Wilson estate to the National Musum.—W. L. S.]

SCOLECITHRICELLA TYDEMANI A. Scott

Scolecithricella tydemani A. SCOTT, Copepoda of the *Siboga*-Expedition, monogr. 29a, pt. 1, p. 93, pl. 30, figs. 10–17, 1909.

Station 5185. Established upon a single female taken in the Halmahera Sea by the *Siboga* and fully described by A. Scott, it was later placed in synonymy with *Amallothrix ostusifrons* by Sars (1925, p. 179) but is here validated by the discovery of two females from this *Albatross* station a little farther north, the first record of the species since the original discovery.

SCOLECITHRICELLA VITTATA (Giesbrecht)

PLATE 18, FIGURES 233, 234

Scolecithrix vittata GIESBRECHT, Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 266, 283, pl. 13, figs. 2, 23, 32, 34; pl. 37, figs. 5, 8, 1892.

Stations 470; 4637; 4700; 4850; Fiji Islands. Identified by Sars from the second and third of these *Albatross* stations and from one Monaco station. The female is fully described in the Monaco report. Giesbrecht's type came from the Bay of Naples, and the Monaco specimen came from the temperate Atlantic; hence this is the first record from the Pacific. The male remains unknown.

Genus SCOLECITHRIX Brady, 1883

SCOLECITHRIX DANAE (Lubbock)

Undina danae LUBBOCK, Trans. Ent. Soc. London, new ser., vol. 4, p. 21, pl. 9, figs. 6–9, 1856.

Stations 6; 13; 15; 16; 18; 26; 27; 30; 52–62; 64; 65; 71; 75–82; 2195; 2396; 3829; 3867; 3878; 3901; 3912; 3930; 3932; 3980; 4009–4011; 4037; 4574; 4580; 4588; 4611; 4635; 4638; 4640; 4644; 4646; 4648; 4659; 4663; 4674; 4684; 4687; 4700; 4706–4708; 4710; 4713; 4714; 4716; 4719; 4721; 4722; 4724; 4730; 4732; 4734; 4740; 4751; 4926; 5102; 5129; 5133; 5134; 5155; 5180; 5185; 5186; 5190; 5223; 5225–5227; 5240; 5246; 5263; 5319; 5320; 5340; 5346; 5410; 5411; 5415; 5422; 5430; 5553; Sabtán Island, Philippine Islands; Fiji Islands; Ellice Islands. Identified by Sars from 32 of these *Albatross* stations and 33 stations; found also at several *Challenger*, 63 *Siboga*, and 80 *Carnegie* stations. This is the most widely distributed species of the genus. It is often taken in large numbers at consecutive stations.

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Genus SCOLECOCALANUS Farran, 1936

SCOLECOCALANUS SPINIFER, new species

PLATE 35, FIGURES 528–531

Station 5321. Farran (1936, p. 102) estabished the genus *Scolecocalanus* for two species, *S. galeatus* and *S. lobatus*, taken during the British Expedition to the Great Barrier Reef of Australia. Both of the species were founded upon females alone and have never been recorded by any other author. Two females and a male of this new species were taken at this station between Formosa and Luzón in a vertical haul from the bottom at 26 fathoms to the surface.

Female.—Metasome elliptical, two and a half times as long as wide; head fused with the first segment to form a cephalothorax longer than the rest of the metasome. Forehead armed with a high galeate crest, which extends back on to the dorsal surface of the head. Fourth and fifth segments partially fused, with the posterior corners extending back beyond the center of the genital segment, and the posterior margin deeply reentrant on the dorsal surface. The urosome is 4-segmented, the segments diminishing considerably in length but only a little in width posteriorly. The genital segment is asymmetrical, being produced outward and backward on the right side, the right posterior corner ending in an acute spine, which extends back over the first abdominal segment and nearly reaches its posterior margin, and is prominent in both dorsal and lateral views. The anal segment is very short and reentrant at the center of its posterior margin. The caudal rami are wider than long, somewhat divergent, and on a level with the ventral surface of the anal segment, each with five terminal setae.

The first antennae are rather slender and reach beyond the tips of the caudal rami by two segments. The exopod of the second antenna is one-half longer than the endopod, and the end segment is longer than the second segment. The second maxilla has five lateral lobes, with very long setae and three short terminal segments. The maxilliped is 7-segmented and tapers regularly from base to tip and is sparsely setose. The first four pairs of legs have 3-segmented exopods and endopods with 1, 2, 3, and 3 segments, respectively. Only the left fifth foot is present as in Farran's two species; the basal segment has a small finger process at the distal end on the anterior surface, and the long curved terminal spine is without a trace of spinules or hairs on either margin. Total length 4.38 mm. Metasome 3.80 mm. long, 1.53 mm. wide.

Male.—Metasome with the same general structure as in the female, but the frontal crest is a little longer and extends farther back on the

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dorsal surface. The fifth segment is more fully separated from the fourth, and its posterior corners are smoothly rounded, with a small curved spine nearer the ventral surface. The urosome is relatively longer and thicker dorsoventrally, and the caudal rami being on a level with the ventral surface are depressed far below the dorsal surface.

The first antennae reach the second abdominal segment, and neither of them is geniculate. The second antennae, mouth parts, and first four pairs of legs are like those of the female, while the fifth legs are peculiar to the genus. In the right leg the second basipod is swollen, the endopod is 1-segmented and nearly reaches the tip of the exopod, and the latter is 2-segmented, the first segment one-half longer than the second. The end segment is swollen distally into three lobules, is flattened on the inner surface, and is tipped with a small spine. The left leg is about the same length as the right, the second basipod twice the length of the first, and the two combined almost reach the distal end of the first segment of the right exopod. The left exopod is 2-segmented, the second segment longer than the first, swollen at its tip and armed with two or three spines. The left endopod is 1-segmented and almost as long as the exopod, the tip curved over and pressed into the shape of the bowl of a ladle. Since there was but the single male the fifth legs were left intact, and the right one was drawn from the right side and the left one from the left side. The figure of the left leg therefore needs to be turned over to get it in correct position with reference to the right leg. Total length 4.25 mm. Metasome 3.60 mm. long, 1.53 mm. wide.

Types.—U.S.N.M. No. 74155; station 5321, latitude 20°19′30″ N., longitude 121°51′15″ E., China Sea off Hong Kong.

Remarks.—The female can be identified easily by the spine on the genital segment, whence the specific name; the details of the fifth legs best characterize the male.

Genus SCOTTOCALANUS Sars, 1905

SCOTTOCALANUS FARRANI A. Scott

PLATE 35, FIGURES 533–537

Scottocalanus farrani A. SCOTT, Copepoda of the *Siboga*-Expedition, monogr. 29a, pt. 1, p. 100, pl. 24, figs. 1–9; pl. 29, figs. 11–18, 1909.

Station 5231. Established by Scott in the *Siboga* plankton upon 53 specimens, including both sexes, from the western tropical Pacific and reported by Sewell (1913, p. 354; 1929, p. 183) from the Indian Ocean. Three males and two females were found in the plankton of this *Albatross* station in the Philippines. The fifth legs of the male seen in figure 537 leave no doubt of the identity of the species. In

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these *Albatross* males there was a fringe of small spines on the posterior margin of each of the first four urosome segments. Since similar spines are not mentioned in the other species of the genus, they will serve as additional marks of identification. It is also worthy of note that in the *Siboga* plankton with one exception these specimens were taken in vertical hauls from considerable depth; the tow made by the *Albatross* at this station was also a vertical haul, from 80 fathoms to the surface.

SCOTTOCALANUS HELENAE (Lubbock)

PLATE 36, FIGURES 543–546

Undina helenae LUBBOCK, Trans. Ent. Soc. London, new ser., vol. 4, p. 25, pl. 4, fig. 4; pl. 7, figs. 1–5, 1856.

Station 5231. Established by Lubbock upon male specimens from the northern Atlantic and placed in the genus *Undina;* transferred by A. Scott in the *Siboga* plankton to the present genus. It does not appear in any of the plankton lists but has been found by several other authors. Twenty-five specimens including both sexes, were obtained at this *Albatross* station between Bohol and Leyte in a tow at a depth of 80 fathoms. The female is described here for the first time.

Female.—Metasome elliptical, narrowed considerably at each end; head fused with the first segment, the separation indicated by a very short dorsal groove. The two combined are nearly two-thirds the entire length of the metasome, and the head carries a prominent frontal crest. Fourth and fifth segments separated, the latter with short acute spines at the posterior corners, which overlap the genital segment a little. Urosome a fourth as long and wide as the metasome and made up of four segments, which diminish in length and width distally. In lateral view each segment projects at its posterior margin above the following segment. The genital segment is nearly as long as the three abdominal segments combined and is slightly protuberant ventrally. The anal segment is very short and scarcely visible in dorsal view. The caudal rami are well separated, about twice as long as wide, and strongly divergent.

The first antennae are stout at the base but quickly become very slender and reach the caudal rami. The exopod of the second antenna is much longer than the endopod, and the end segment is about as long as the second segment. The mouth parts and first four pairs of legs are much like those of other species of the genus, but the fifth legs are different. Each leg is made up of three distinct segments, the basal segment with a rounded process at the outer distal corner, the second segment with parallel sides and the end segment considerably swollen.

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The terminal spine is short, curved and clawlike; the subterminal spine is stout, twice as long as the entire leg with a single row of rather coarse spines and not divided at the tip. Total length 4.50 mm. Metasome 3.40 mm. long.

Male.—Metasome elongate-elliptical, evenly contracted at each end; head fused with first segment and the two together five-eighths of the length of the metasome, with a prominent frontal crest. Fourth and fifth segments more or less fused, with angularly pointed posterior corners. Urosome a little more than a third as long and a little less than a third as wide as the metasome, and made up of five segments. The first four segments are about equal in length but the anal segment is only one-fifth as long. The caudal rami are as wide as long, well separated and nearly parallel.

The first antennae reach the anal segment; the second antennae, mouth parts, and first four pairs of legs are like those of the female, the fifth legs are distinctive. The right leg is longer than the left, the second basipod is swollen to twice the diameter of the first and is nearly a sphere. The endopod is 2-segmented, the second segment sickle-shaped and with a distinct tooth near the center of the outer margin. The exopod is 2-segmented, the basal segment with an angular process at the inner distal corner. The terminal segment is sickle-shaped, swollen at the end and tipped with a curved spine. The two basipods of the left leg reach the center of the basal exopod segment of the right leg. The endopod is laminate, 1-segmented, tongue-shaped, and just reaches the tip of the basal exopod segment. The exopod is 2-segmented, the segments about equal in length, the end segment tipped with two long curved filaments and a bunch of shorter ones on the inner distal margin. Total length 4.75 mm. Metasome 3.17 mm. long.

Allotype female.—U.S.N.M. No. 74156; station 5231, latitude 10°01′15″ N., longitude 124°43′15″ E., between Bohol and Leyte, Philippine Islands.

Remarks.—The discovery of the female of this species verifies Scott's separation of the male as a new species and proves that it cannot be made a synonym of the species *persecans* as advocated by Farran. [See Sewell (1929, p. 183) for discussion of the synonymy of this species. If he is right in considering *S. thorii* With, 1915, as a synonym of *S. helenae*, then the female has been described by With. Further study of these *Albatross* specimens may be necessary to clear up this point.—M. S. W.]

SCOTTOCALANUS LONGISPINUS A. Scott

Scottocalanus longispinus A. Scott, Copepoda of the *Siboga*-Expedition, monogr. 29a, pt. 1, p. 109, pl. 25, figs. 10–18, 1909.

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Stations 5231; 5233; 5240; 5246; 5287. Established in the *Siboga* plankton upon a single female from the Halmahera Sea in a vertical haul from a depth of 1,000 meters; not since found. A small number of females were obtained at these *Albatross* stations east of Mindanao and just north of the *Siboga* locality in vertical hauls varying between 310 and 80 fathoms to the surface.

SCOTTOCALANUS PERSECANS (Giesbrecht)

Scolecithrix persecans Giesbrecht, Bull. Mus. Comp. Zool., vol. 25, No. 12, p. 253, pl. 3, figs. 6–12, 1895.

Stations 4667; 4732; 4734; 5185; 5227; 5231; 5263; 5287. Identified by Sars from the first three of these *Albatross* stations and from 50 Monaco stations; present also in the *Siboga* plankton where all the specimens obtained were males.

SCOTTOCALANUS SECURIFRONS (T. Scott)

Scolecithrix securifrons T. Scott, Trans. Linn. Soc. London, ser. 2, Zool., vol. 6, pt. 1, p. 47, pl. 4, figs. 40–56; pl. 5, fig. 1, 1894.

Stations 26; 27; 30; 4638; 4681; 4685; 4703; 4705; 4715; 4717; 4720–4722; 4730; 4732; 4734; 4736; 4740; 4742; 5120; 5185; 5221; 5227; 5231; 5246; 5287. Identified by Sars from 18 of these *Albatross* stations and from 25 Monaco stations; and found at 10 stations in the *Siboga* list. With one exception, the *Siboga* specimens were taken in vertical hauls starting from depths of 80 fathoms or more, 15 hauls were from 30 fathoms, and one, indeed, was from 550 fathoms.

SCOTTOCALANUS SETOSUS A. Scott

Scottocalanus setosus A. Scott, Copepoda of the *Siboga*-Expedition, monogr. 29a, pt. 1, p. 108, pl. 24, figs. 10–18, 1909.

Stations 5185; 5231; 5437. Established by Scott upon female specimens from the western tropical Pacific and described in the *Siboga* plankton. These *Albatross* specimens are the first to be recorded since the original discovery, and they come from the same locality.

SCOTTOCALANUS THOMASI A. Scott

Plate 36, Figure 547

Scottocalanus thomasi A. Scott, Copepoda of the *Siboga*-Expedition, monogr. 29a, pt. 1, p. 109, pl. 26, figs. 1–10; pl. 28, figs. 10–17, 1909.

Stations 3799; 5120; 5185; 5227; 5231; 5233; 5437; 5451. Established by Scott in the *Siboga* plankton upon specimens from the Banda Sea just south of the Equator in the western Pacific and reported from the Indian Ocean by Sewell (1929, p. 184). Most of these

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Albatross specimens came from a little farther north in the Philippines and included females only. This sex can be identified by the peculiar structure of the long subapical seta on the fifth legs as shown in figure 547. This seta is somewhat flattened dorsoventrally and divided at its tip, one branch being fringed with hairs while the other is smooth. [Sewell finds that the V-shaped appearance of the end of this spine is due to viewing the enlarged spinules of the distal portion in profile.—M. S. W.]

Genus SPINOCALANUS Giesbrecht, 1888

SPINOCALANUS ABYSSALIS Giesbrecht

Spinocalanus abyssalis GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 4, sem. 2, p. 335, 1888; Fauna und Flora des Golfes von Neapel, monogr. 19, p. 209, pl. 13, figs. 42–48; pl. 36, fig. 49, 1892.

Stations 53; 76; 3799; 4663. Identified by Sars from three Monaco stations and appearing otherwise only in the *Carnegie* plankton. Both sexes are described by Sars (1901, p. 22; 1903, p. 157) in the "Crustacea of Norway."

SPINOCALANUS MAGNUS Wolfenden

Spinocalanus magnus WOLFENDEN, Journ. Mar. Biol. Assoc. United Kingdom, new ser., vol. 7, No. 1, p. 118, 1904.

Station 5226. Established by Wolfenden upon specimens obtained in the northern Atlantic; described and figured by Sars in the Monaco plankton and appearing in the *Carnegie* list.

Genus STEPHOS T. Scott, 1892

STEPHOS PERPLEXUS, new species

PLATE 36, FIGURES 548–550

Stations 27; 5319. Each of these stations yielded a single male. The males have exceptionally complicated fifth legs which have a general resemblance to those of the preceding genus.

Male.—Metasome elliptical, the length two and two-thirds times the width; head fused with the first segment, narrowed and rounded in front and widest at its posterior margin. Fifth segment with sharp posterior corners turned inward but without spines. Urosome one-fourth as wide and one-third as long as the metasome and 5-segmented, the segments all the same width and nearly the same length. Caudal rami widely separated at the corners of the anal segment, divergent, and as wide as long.

First antennae reach the anal segment, are rather slender, and neither of them is geniculate. The exopod of the second antenna is longer than the endopod, and its end segment is longer than the sec-

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ond segment. Exopods of the first four pairs of legs 3-segmented, endopods with one, two, three, and three segments, respectively. Fifth legs rather complicated and very bizarre, the right leg much longer than the left. The two basipod segments of this leg are about the same length and folded together. Exopod 3-segmented, the basal segment armed with a tuft of lanceolate leaflike appendages, the other two segments triangular and very unequal in size; endopod 3-segmented and turned inward. The left leg is large and tumid; the exopod has two swollen segments tipped with a long curved claw and an irregular wormlike process; the endopod is a long and slender spine with an S-shaped curve. Total length, including caudal rami 2.90 mm. Greatest width 0.86 mm.

Type.—U.S.N.M. No. 74157; station 5319, latitude 21°31′ N., longitude 117°53′ E., China Sea, near Formosa.

Remarks.—These fifth legs do not correspond exactly with those of the genus *Stephos* but at least they are equally bizarre, and it is better to leave the erection of a new genus for this species until the female is obtained.

Genus TEMORA Baird, 1850

TEMORA DISCAUDATA Giesbrecht

PLATE 36, FIGURES 551–553

Temora discaudata GIESBRECHT, Atti Accad. Lincei Rome, ser. 4, vol. 5, sem. 1, p. 814, 1889; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 328, 333, pl. 17, figs. 3, 20, 23; pl. 38, figs. 24, 25, 28, 1892.

Stations 12; 13; 15; 16; 27; 30; 65; 66; 70; 71; 73; 77–79; 4611; 4638; 4640; 4644; 4646; 4663; 4664; 4734; 5133; 5180; 5185; 5186; 5190; 5209; 5223; 5225; 5226; 5228; 5230; 5240; 5262; 5263; 5301; 5319; 5320; 5338; 5340; 5348; 5399; 5424; 5434; 5489; 5553; 5646; 5647; 5651; 5661; Charles Island, Galápagos. Identified by Sars from 13 of these *Albatross* stations but not recorded in his Monaco list. It was well distributed in the *Siboga* and the *Carnegie* planktons.

TEMORA LONGICORNIS (Müller)

Cyclops longicornis MÜLLER, Entomostraca, p. 115, pl. 19, figs. 7–9, 1785.

Stations 7; 9; 10; 16; 27; 30; 71; 2396; 4952; 5129; 5133; 5175; 5176; 5180; 5185; 5186; 5190; 5223; 5225–5228; 5232; 5262; 5263; 5301; 5319; 5381; 5382; 5415; 5424; 5434; 5437; 5488; 5651; Iloilo Straits, Philippine Islands. This is a surface species and often swarms in large numbers in favorable localities. It occurred also in the Monaco and *Carnegie* planktons.

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TEMORA STYLIFERA (Dana)

PLATE 34, FIGURE 526

Calanus stylifer DANA, Proc. Amer. Acad. Arts and Sci., vol. 2, p. 13, 1849; United States Exploring Expedition 1838–1842 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1053, 1853; pl. 72, fig. 9, 1855.

Stations 9; 16; 27; 30; 48; 70; 71; 77; 78; 80; 81; 2396; 2792; 3799; 4588; 4611; 4640; 4644; 4926; 4952; 5102; 5129; 5133; 5134; 5155; 5175; 5176; 5180; 5185; 5186; 5190; 5196; 5199; 5208; 5209; 5223; 5225; 5226; 5228; 5230–5234; 5240; 5246; 5262; 5263; 5299; 5301; 5319; 5320; 5338; 5340; 5342; 5358; 5382; 5386; 5399; 5422; 5424; 5434; 5488; 5489; 5530; 5553; 5601; 5646; 5651; 5672; Iloilo Straits, Philippine Islands; Fiji Islands; Gilbert Islands; Charles Island, Galápagos. This is a widely distributed species and was recorded from many stations in the Monaco and *Carnegie* planktons; unexpectedly absent from the *Siboga* list.

TEMORA TURBINATA (Dana)

Calanus turbinatus DANA, Proc. Amer. Acad. Arts and Sci., vol. 2, p. 12, 1849; United States Exploring Expedition, 1838–1842 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1057, 1853; pl. 72, fig. 8, 1855.

Stations 2219; 5175; 5176; 5246; 5262; Iloilo Straits, Philippine Islands. This species was found at 3 Monaco and 25 *Siboga* stations but was not present in the *Carnegie* plankton. The *Siboga* specimens were taken in vertical hauls from considerable depths, which would suggest that this species frequents deeper waters than the rest of the genus, yet with one exception, station 5246, a vertical haul from 100 fathoms to the surface, all the *Albatross* specimens were secured by means of surface tows.

Genus TEMORITES Sars, 1900

TEMORITES BREVIS Sars

PLATE 35, FIGURE 539

Temorites brevis SARS, Norwegian North Polar Exped., vol. 5, Crustacea, p. 100, pls. 30, 31, 1900.

Station 5180. Two females were found in the plankton at this station in the vicinity of Romblon Island in the Philippines. Originally obtained by Sars from the North Polar Ocean, it was later identified by him from the Mediterranean (1925, p. 194), and is here recorded from the tropical Pacific from three widely separated localities.

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Genus TIGRIOPUS Norman, 1869

TIGRIOPUS INCERTUS Smirnov

PLATE 36, FIGURES 554–559

Tigriopus incertus SMIRNOV, Trans. Arctic Inst. U. S. S. R., vol. 2, p. 205, figs. 16–23, 1932.

Twenty-five specimens (U.S.N.M. Nos. 74158 and 78840), including both sexes, were obtained in a tow through the kelp about Rat Island in the western Aleutian Islands by V. B. Scheffer, of the U. S. Biological Survey, June 26, 1932. They are the first to be obtained since the original discovery by Smirnov off Franz Josef Land. Smirnov's description and figures are correct but rather brief, hence a full description is here supplied, together with supplementary figures.

Female.—Metasome elongate-ovate, only a little narrowed posteriorly, the first three thoracic segments with lateral lappets. Rostrum wide, spatulate, and curved over ventrally but prominent in dorsal view. Urosome narrower than the metasome but two-thirds as wide as long, the segments diminishing in length backward. The anal segment is quite short and reentrant at the center of its posterior margin, but the sinus is not very deep. Caudal rami as wide as long, the long inner setae more than twice the length of the entire urosome.

The first antennae are about as long as the cephalic segment and are 9-segmented, the four basal segments thick and robust, the five distal segments slender and short. Exopod of second antenna 4-segmented, with five setae, the end segment the longest and tipped with two unequal setae. Second maxillae broad; hand of chela on maxillipeds ellipsoidal, considerably narrowed at each end, the dactylus rather weak and reaching only to the center of the hand. First legs prehensile, the proximal segment of the exopod as long as the other two segments combined, the end segment with four stout curved claws and two setae. Endopod with basal segment almost six times as long as the other two segments combined, the end segment with two slender claws. Fifth legs of the usual pattern, the outer process of the basal segment rather large with a long seta, the inner expansions of the two legs partially fused on the midline, each reaching the center of the distal segment and armed with four setae, the second outer one the longest. Distal segment ovate, about twice as long as wide with four setae; the terminal one the longest. Total length 1.50 mm. Width of head 0.52 mm.

Male.—About the same size as the female but with a somewhat narrower metasome and urosome. First antenna stout, the terminal chela with a globular hand and a reduced clawlike dactylus. Outside of the base of the dactylus is a triangular process and a spine, the latter at

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the tip of the hand. The endopod of the second legs has an elongate acuminate spine at the distal corner of the outer margin of the second segment, which reaches far beyond the tip of the third segment. The fifth legs are much reduced in size, the inner expansion of the basal segment has entirely disappeared, and the outer process is represented by a short spine. The terminal segment is very small and armed with four setae. A sixth pair of legs is indicated at the posterior corners of the genital segment by one larger spine and several smaller ones.

Neotypes.—U.S.N.M. No. 74158, Rat Islands, western Aleutian Islands.

Remarks.—As noted by Smirnov, the second legs of the male resemble those of the genus *Harpacticus* more than those of *Tigriopus*. But in other respects the male and in all details the female correspond to the present genus.

Genus TORTANUS Giesbrecht, 1898

TORTANUS BARBATUS (Brady)

PLATE 36, FIGURE 560

Corynura barbata BRADY, Voyage of H. M. S. *Challenger*, Zool., vol. 8, pt. 23, Copepoda, p. 71, pl. 31, figs. 10–12, 1883.

Stations 5175; 5176. Established by Brady upon a single female from Zebu Harbor, Philippine Islands and three females recorded by Scott in the *Siboga* plankton from Manipa Strait just south of the Philippines. A male was added by Früchtl (1923, p. 456) from the Aru Islands, and the species was reported from the Bay of Bengal by Sewell (1912, p. 377). As can be seen in the figure, the fifth legs of the female are very asymmetrical, the left one with a tuft of curved claws at the center of the inner margin.

TORTANUS DISCAUDATUS (Thompson and Scott)

Corynura discaudata THOMPSON and SCOTT, Trans. Liverpool Biol. Soc., vol. 12 (1898), p. 80, pl. 6, figs. 1–11; pl. 7, figs. 1, 2, 1897.

Stations 4756; 4758. Identified by Sars from these *Albatross* and from two Monaco stations and is not found in the other planktons. It has generally been considered a littoral rather than a pelagic species, as it is sometimes found in considerable numbers close to shore. The *Albatross* specimens were taken in vertical hauls to the surface from 75 and 300 fathoms respectively.

TORTANUS FORCIPATUS (Giesbrecht)

Corynura forcipata GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 5, sem. 2, p. 26, 1889; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 525, 530, pl. 31, figs. 2, 3, 5, 7, 9, 10, 12, 15; pl. 42, figs. 34, 37, 1892.

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Station 5287. Established by Giesbrecht upon female specimens from the straits of Formosa; the male was afterward added by Sewell (1914, p. 249). The species is declared by A. Scott in the *Siboga* plankton (p. 190) to be distinct from *gracilis*, with which it has been made synonymous by some writers. The *Albatross* specimens support Scott's decision. In the female the right leg is almost twice as long as the left, while in the male the two fifth legs are of equal length.

TORTANUS GRACILIS (Brady)

Corynura gracilis BRADY, Voyage of H. M. S. *Challenger*, Zool., vol. 8, pt. 23, Copepoda, p. 71, pl. 3, figs. 1–14, 1883.

Stations 5102; 5129; 5175; 5176; 5246; 5340; 5410; 5411; Gilbert Islands. Brady obtained specimens of both sexes from the Philippine Islands and made them a new species of the genus *Corynura*. This genus name being preoccupied, Giesbrecht (1898, p. 157) substituted Scott's decision. In the female the right leg is almost twice as long as the left, while in the male the two fifth legs are of equal length.

TORTANUS MURRAYI A. Scott

PLATE 18, FIGURES 235–242

Tortanus murrayi A. SCOTT, Copepoda of the *Siboga*-Expedition, monogr. 29a, pt. 1, p. 191, pl. 56, figs. 1–8, 1909.

Stations 5129; 5175; 5176; 5246; 5301; 5340; 5410; 5411; Iloilo Straits, Philippine Islands; Gilbert Islands. Sars identified specimens obtained in a surface tow at Butaritari Lagoon as a new species and made pencil drawings of all the appendages. They prove, however, to belong to the above species described by Scott in his *Siboga* report, but Sars' figures include details omitted by Scott and for this reason are here included and the species redescribed.

Female.—Metasome elliptical, two and a half times as long as wide; head separated from the first segment and narrowed considerably in front. Fourth and fifth segments fused with smoothly rounded corners and without spines or processes. Urosome nearly symmetrical, but the genital segment has a small tubercle at the left posterior corner and the left caudal ramus is enlarged a little.

The first antennae extend beyond the caudal rami and have three or four large setae at their tips. The exopod of the second antenna is shorter than the endopod, and the second segment is three-fifths of the entire length. The three terminal segments carry setae that are longer than the entire exopod. The disal segment of the endopod is three-fifths as long as the proximal segment and not lobed at the tip. The outer tooth on the chewing blade of the mandible is enlarged,

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bluntly pointed, and inclined away from the other teeth. The latter are four in number and close together and suggest the fingers of a hand with the large tooth a swollen thumb. The palp has a long basipod and two short rami each 1-segmented and armed with three setae. The basal segment of the second maxilla has a large rounded process armed with seven setae at its distal posterior corner, and the end segment has three much longer setae. The maxilliped is very stout and 5-segmented, each segment armed with a long curved seta set with small spines along its concave margin. The fifth legs are symmetrical, neither one being enlarged, and the three spines at the tip of each leg are smaller and less divergent than those figured by Scott. Total length 2.25 mm.

Male.—Similar in general appearance to the female, but the head and posterior metasome are narrower and the urosome is 5-segmented. The caudal rami are the same size, perfectly symmetrical, and six times as long as wide, and the second inner seta on each is elongate. The left fifth leg is much longer than the right and reaches back to the center of the caudal rami. Total length 2.15 mm.

TORTANUS RECTICAUDA (Giesbrecht)

Corynura recticauda GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 5, sem. 2, p. 26, 1889; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 525, 531, pl. 31, figs. 1, 4, 8, 11, 14, 16; pl. 42, figs. 35, 36, 39, 1892.

Station 5415; Iloilo Straits, Philippine Islands. [From the first of these localities, between Cebu and Bohol, one female was identified and preserved by Dr. Wilson (U.S.N.M. No. 78344).—W. L. S.]

Genus UNDEUCHAETA Giesbrecht, 1888

UNDEUCHAETA MAJOR Giesbrecht

PLATE 35, FIGURE 541

Undeuchaeta major GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 4, sem. 2, p. 336, 1888; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 227, 232, pl. 37, figs. 56, 57, 59, 1892.

Stations 2; 32; 3382; 3799; 4427; 4571; 4574; 4679; 4681; 4687; 4691; 4715; 4716; 4722; 4732; 4740; 4757; 4926; 5120; 5155; 5185; 5223; 5227; 5228; 5231; 5233; 5246; 5263; 5287; 5319; 5437; 5451; 5595. Present in the Monaco, *Siboga*, and *Carnegie* planktons. The species is distinguished in the female by a frontal crest and the sharp posterior corners of the metasome, and in the male by the enlarged barblike tip of the right endopod of the fifth legs. Figure 541 shows the fifth legs of mature and immature males.

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UNDEUCHAETA PLUMOSA (Lubbock)

PLATE 35, FIGURE 540

Undina plumosa LUBBOCK, Trans. Ent. Soc. London, new ser., vol. 4, p. 24, pl. 9, figs. 3–5, 1856.

Stations 15; 16; 26; 27; 74; 2195; 3799; 3800; 4009; 4010; 4681; 4683; 4685; 4687; 4691; 4705; 4730; 4740; 4926; 5120; 5180; 5185; 5186; 5227; 5231; 5233; 5234; 5246; 5263; 5319; 5437; 5451; 5595; H. 3789. Present, like the preceding species, in the Monaco, *Siboga*, and *Carnegie* planktons. The female has no frontal crest, and on the dorsal surface of the genital segment is a recurved spine; the fifth legs of the male have the form shown in figure 540.

Genus UNDINULA A. Scott, 1909

UNDINULA CAROLI (Giesbrecht)

PLATE 19, FIGURES 252–255

Calanus caroli GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 4, sem. 2, p. 331, 1888; Fauna und Flora des Golfes von Neapel, monogr. 19, pp. 91, 127, pl. 8, fig. 3, 1892.

Stations 6; 7; 9; 15; 19; 27; 31; 64; 65; 71; 75–78; 470; 3829; 3834; 3867; 3878; 3901; 3912; 3929; 3930; 3980; 4009; 4010; 4011; 4037; 4614; 4743; 4926; 5120; 5126; 5129; 5134; 5180; 5185; 5186; 5190; 5196; 5223–5226; 5228; 5231; 5234; 5240; 5246; 5253; 5262; 5308; 5319; 5320; 5340; 5386; 5396; 5397; 5399; 5412; 5415; 5422; 5434; 5437; 5507; 5601; 5646; Fiji Islands. This species was well distributed in the *Siboga* and *Carnegie* planktons and was often abundant, but it was not present in the Monaco plankton. There has always been difficulty in separating this from the following species; in fact the two are still regarded as the same species by some authors. Scott, however, in the *Siboga* plankton fully established the two males as separate species but had to acknowledge that he was unable to separate the females. This was reserved for Sars, whose detailed figures of the two species reveal the following distinguishing features:

Female.—Head somewhat narrowed anteriorly, with a smoothly rounded forehead, posterior corners of the metasome asymmetrical, the one on the left reaching the distal margin of the genital segment, closely appressed to the latter, and smoothly rounded at its tip, the one on the right not reaching the center of the genital segment and inclined outward away from it. The urosome is the same width throughout, the anal segment fully as wide as the genital segment. The latter is as thick dorsoventrally as it is long and has no dorsal posterior spine. The short setae on each caudal ramus are less than a sixth as long as the longest one.

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Male.—On the first basipod of the left fifth foot the row of denticles along the inner margin runs off onto the posterior surface just beyond the center of the segment, leaving the distal part of the margin smooth. The endopod is attached to the center of the inner margin of the second basipod and is bilobed at its tip. The base of the terminal chela of the exopod is enlarged to twice the diameter of the segment to which it is attached and then abruptly narrowed at the origin of the arms. The inner arm is widened at the base and the tip and narrowed between the two and the swelling at the tip is trilobate. The inner tooth on the outer arm is about one-fourth of the length of the arm from its base, often still nearer to the base.

Remarks.—These are the details that help to characterize the species and that are to be compared with those given below for *U. darwinii*, in order that the two species may be completely separated.

UNDINULA DARWINII (Lubbock)

PLATE 19, FIGURES 256–259

Undina darwinii LUBBOCK, Trans. Linn. Soc. London, vol. 23, p. 179, pl. 29, figs. 4, 5, 1860.

Stations 4; 8; 9; 13; 19; 23; 27; 31; 63–68; 70; 71; 75–78; 80; 82; 236; 3681; 3782; 3829; 3878; 3912; 3980; 4011; 4037; 4588; 4613; 4635; 4638; 4644; 4648; 4671; 4681; 4700; 4705; 4707; 4708; 4713–4716; 4722; 4730; 4734; 4742; 5134; 5155; 5185; 5190; 5199; 5233; 5320; 5386; 5387; 5507. Reported in the *Challenger*, *Carnegie*, and *Siboga* plankton lists. The following characters distinguish this from the preceding species and will identify it:

Female.—Head narrowed scarcely at all, with a somewhat pointed forehead; the posterior corners of the metasome symmetrical, each extending just beyond the center of the genital segment and angular at the tip. In the urosome the genital segment is considerably wider anteriorly than the abdomen, but tapers to the same width posteriorly. It is not so thick as it is long, and it has a sharp spine on the posterior margin at the center of the dorsal surface. The short setae on each caudal ramus are more than half as long as the longest one and the two longest ones are curved like parenthesis marks.

Male.—On the first basipod of the left fifth foot the row of denticles along the margin does not run off on to the dorsal surface but keeps along the margin. The endopod is attached to the inner distal corner of the second basipod and is not bilobed at its tip. The base of the terminal chela of the exopod is enlarged to almost twice the diameter of the segment to which it is attached, but it is not narrowed at the base of the arms and keeps the same width throughout its length. The inner arm is much widened at its base and tapers distally to an appar-

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ent joint beyond the center. On the posterior surface on either side of the joint is a small papilla tipped with a minute seta. The segment beyond the joint is abruptly widened and armed with a stout bifurcate process. The tooth on the inner margin of the outer arm is at or near the center.

UNDINULA VULGARIS (Dana)

PLATE 19, FIGURE 260

Undina vulgaris DANA, Proc. Amer. Acad. Arts and Sci., vol. 2, p. 22, 1849; United States Exploring Expedition, 1838–1842 (Wilkes), vol. 14, pt. 2, Crustacea, p. 1092, 1853; pl. 77, fig. 8 a–d, 1855.

Stations 15; 16; 27; 30; 31; 48; 71; 73; 75–80; 3799; 3829; 3834; 3867; 3878; 3901; 3912; 3929; 3930; 3932; 3980; 4009; 4010; 4011; 4037; 4086; 4538; 4588; 4592; 4598; 4600; 4607; 4611; 4615; 4619; 4627; 4635; 4638; 4640; 4644; 4646; 4653; 4700; 4738; 4926; 4952; 5102; 5105; 5120; 5126; 5133; 5134; 5155; 5175; 5180; 5185; 5186; 5190; 5191; 5196; 5211; 5223–5230; 5240; 5246; 5258; 5262; 5263; 5309; 5319; 5320; 5338; 5340; 5342; 5348; 5349; 5358; 5382; 5386; 5387; 5396; 5397; 5412; 5415; 5422; 5424; 5434; 5489; 5507; 5530; 5553; 5578; 5595; 5596; 5633; 5646; 5651; Iloilo Straits, Caldera Bay anchorage, and Sabtán Island, Philippine Islands; Fiji Islands; Gilbert Islands; Marshall Islands. A very widely distributed species in all planktons; in addition to these *Albatross* localities, it was reported from 4 stations in the Wilkes plankton by Dana, "in all the gatherings from the tropical Atlantic," by Brady in the *Challenger* plankton, and from 75 *Siboga*, 25 Monaco, and 89 *Carnegie* stations. It is also often found in large numbers; Scott listed 11 stations yielding 100 to 400 specimens each and 1 station at which 1,336 specimens were obtained. Many of the *Albatross* stations yielded over a hundred specimens apiece and one, station 4009, in the Hawaiian Islands, produced a solid pint of specimens, half of which were *vulgaris*.

Genus VALDIVIELLA Steuer, 1904

VALDIVIELLA INSIGNIS Farran

Valdiviella insignis FARRAN, Fisheries Ireland, Sci. Invest. for 1906, pt. 2, p. 45, pl. 3, figs. 1–6; pl. 4, fig. 5, 1908.

Stations 4719; 5233; Iloilo Straits, Philippine Islands. Identified by Sars from the first of these *Albatross* stations, and from 16 Monaco stations; both sexes were fully described and figured in the Monaco report. First reported from the Pacific area by Sewell (1929, p. 135), who collected both sexes in the Indian Ocean.

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Genus VETTORIA Wilson, 1924

VETTORIA GRANULOSA (Giesbrecht)

Corina granulosa GIESBRECHT, Atti Accad. Lincei, Rome, ser. 4, vol. 7, sem. 1, p. 479, 1891; Fauna und Flora des Golfes von Neapel, monogr. 19, p. 645, pl. 49, figs. 39–45; pl. 50, figs. 53, 54, 1892.

Stations 4663; 4952; 5232. This species appears in the Monaco (Rose) and *Carnegie* lists.

Genus XANTHOCALANUS Giesbrecht, 1892

XANTHOCALANUS GREENI Farran

Xanthocalanus greeni FARRAN, Ann. Rep. Fisheries, Ireland, 1902–03, pt. 2, app. 2, p. 39, pl. 8, figs. 1–13, 1905.

Stations 2219; 4665. Identified by Sars from the second of these two *Albatross* stations. The first one is off the coast of New Jersey and the other off the coast of Peru, making the first record from the Pacific. It was also found at five stations in the Monaco plankton and is there fully described.

XANTHOCALANUS PINGUIS Farran

PLATE 36, FIGURE 561

Xanthocalanus pinguis FARRAN, Ann. Rep. Fisheries, Ireland, 1902–03, pt. 2, app. 2, p. 39, pl. 8, figs. 18–24; pl. 9, figs. 1–6, 1905.

Station 4707; Marshall Islands. These two localities are both in the Pacific Ocean and are the first record from that ocean. The species was found at a single station in the Monaco plankton from which the female is described. The female can be recognized by the distinct separation of the fourth and fifth segments and the details of the fifth legs (see figure 561).

LIST OF NEW SPECIES DESCRIBED IN THIS PAPER

Acartia hamata, ♀
Amallothrix invenusta, ♀
Arietellus tripartitus, ♀
Calanopia sarsi, ♂ ♀
Candacia turgida, ♀
Dysgamus pacificus, ♂
Eucalanus muticus, ♂ ♀
Euchirella grandicornis, ♂ ♀
Gaetanus curvispinus, ♂ ♀
Gaetanus microcanthus, ♂ ♀
Labidocera albatrossi, ♀
Labidocera insolita, ♂ ♀
Labidocera tenuicauda, ♂ ♀
Lophothrix sarsi, ♀
Macandrewella agassizi, ♂ ♀
Pontella diagonalis, ♀
Pontella gracilis, ♀
Pontella pulvinata, ♂ ♀
Pontella surrecta, ♂ ♀
Pontellopsis albatrossi, ♀
Pontellopsis bitumida, ♂ ♀
Pontellopsis digitata, ♀
Pontellopsis globosa, ♀
Pontellopsis laminata, ♀; immature ♂
Pontellopsis sinuata, ♂ ♀
Pseudanthessius pacificus, ♂ ♀
Scaphocalanus insolitus, ♀
Scolecocalanus spinifer, ♂ ♀
Stephos perplexus, ♂

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LISTS OF COPEPODS COLLECTED, ARRANGED BY STATIONS [7]

A. SURFACE TOW-NET STATIONS, 1887–88 [8]

(Voyage around South America)

***1. Lat. 34°13′ N., long. 74°13′30″ W.; North Atlantic; November 22, 1887; surface; 17 species**

Euaugaptilus gibbus
Eucalanus attenuatus
Eucalanus elongatus
Euchaeta acuta
Euchaeta marina
Heterorhabdus papilliger
Lophothrix frontalis
Lucicutia flavicornis
Lucicutia grandis
Lucicutia tenuicauda
Metridia longa
Metridia princeps
Neocalanus tenuicornis
Paracalanus parvus
Pleuromamma gracilis
Pleuromamma xiphias
Sapphirina nigromaculata

***2. Lat. 31°16′ N., long. 71°50′ W.; North Atlantic; November 23, 1887; surface; 31 species**

Amallophora typica
Candacia simplex
Cephalophanes refulgens
Clausocalanus arcuicornis
Clytemnestra rostrata
Corycaeus flaccus
Corycaeus lautus
Dissetus palumboi
Euchirella curticauda
Euchirella galeata
Gaetanus kruppii
Gaetanus miles
Gaidius pungens
Gaussia princeps
Haloptilus longicornis
Heterorhabdus norvegicus
Heterorhabdus papilliger
Lubbockia aculeata
Lucicutia flavicornis
Mecynocera clausi
Metridia princeps
Nannocalanus minor
Oithona similis
Oncaea minuta
Paracalanus parvus
Pareuchaeta tonsa
Phyllopus bidentatus
Pleuromamma abdominalis
Pleuromamma xiphias
Scaphocalanus magnus
Undeuchaeta major

***3. Lat. 18°40′ N., long. 63°30′ W.; North Atlantic; November 27, 1887; surface; 18 species**

Acartia negligens
Aegisthus mucronatus
Arietellus simplex
Candacia bipinnata
Candacia bispinosa
Euchaeta spinosa
Labidocera acutifrons
Labidocera agilis
Lucicutia flavicornis
Mecynocera clausi
Microsetella norvegica
Neocalanus robustior
Oithona similis
Paracalanus parvus
Pleuromamma gracilis
Pontella securifer
Scolecithricella bradyi
Scolecithricella dentata

***4. Lat. 16°54′ N., long. 63°12′ W.; North Atlantic; November 28, 1887; surface; 9 species**

Clausocalanus arcuicornis
Gaussia princeps
Haloptilus longicornis
Metridia gerlachei
Oithona plumifera
Oithona similis
Paracalanus parvus
Pseudocalanus minutus
Undinula darwinii

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[7] Species from stations marked by an asterisk were determined by G. O. Sars; stations marked with a dagger are accompanied by collecting data not appearing in the published dredging records (*cf.* footnote, p. 364).

[8] C. H. Townsend, Dredging and other records of the United States Fish Commission Steamer *Albatross*, with bibliography relative to the work of the vessel, U. S. Fish Commission Report for 1900, p. 477, 1901.

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***5. Lat. 13°34′ N., long. 61°04′ W.; North Atlantic; December 4, 1887; surface; 13 species**

Candacia bipinnata	Gaetanus miles	Neocalanus robustior
Candacia bispinosa	Haloptilus longicornis	Pontella securifer
Clausocalanus arcuicornis	Labidocera detruncata	Pontellina plumata
Euchaeta marina	Lucicutia flavicornis	
Euchirella brevis	Neocalanus gracilis	

***6. Lat. 11°40′ N., long. 58°33′ W.; North Atlantic; December 5, 1887; surface; 18 species**

Arietellus armatus	Haloptilus longicornis	Neocalanus robustior
Candacia aethiopica	Haloptilus spiniceps	Oithona similis
Candacia varicans	Metridia gerlachei	Paracalanus parvus
Centropages violaceus	Microsetella norvegica	Pleuromamma gracilis
Euchaeta marina	Nannocalanus minor	Scolecithrix danae
Gaetanus miles	Neocalanus gracilis	Undinula caroli

***7. Lat. 8°04′ N., long. 52°47′ W.; North Atlantic; December 7, 1887; surface; 25 species**

Arietellus armatus	Gaetanus miles	Oithona similis
Augaptilus longicaudatus	Haloptilus longicornis	Oncaea venusta
Candacia aethiopica	Heterostylites longicornis	Paracalanus parvus
Candacia bipinnata	Mecynocera clausi	Pleuromamma gracilis
Candacia bispinosa	Metridia gerlachei	Pontellina plumata
Centropages calaninus	Metridia lucens	Temora longicornis
Corycaeus agilis	Microsetella norvegica	Undinula caroli
Euaetideus giesbrechti	Neocalanus robustior	
Euaugaptilus filigerus	Oculosetella gracilis	

***8. Lat. 3°22′ S., long. 37°49′ W.; South Atlantic; December 14, 1887; surface; 9 species**

Calocalanus pavo	Oculosetella gracilis	Pleuromamma gracilis
Clausocalanus arcuicornis	Oithona similis	Pseudocalanus minutus
Metridia lucens	Paracalanus parvus	Undinula darwinii

***9. Lat. 12°07′ S., long. 37°17′ W.; South Atlantic; December 18. 1887; surface; 21 species**

Acartia negligens	Euaugaptilus palumboi	Oithona similis
Calocalanus pavo	Labidocera detruncata	Paracalanus aculeatus
Centropages calaninus	Lophothrix frontalis	Pontella danae
Centropages furcatus	Lucicutia flavicornis	Temora longicornis
Centropages violaceus	Mecynocera clausi	Temora stylifera
Clausocalanus arcuicornis	Metridia princeps	Undinula caroli
Clausocalanus furcatus	Neocalanus gracilis	Undinula darwinii

***10. Lat. 15°39′ S., long. 38°32′54″ W.; South Atlantic; December 26, 1887; surface; 7 species**

Centropages calaninus	Oithona spinirostris	Temora longicornis
Corycaeus lubbockii	Paracalanus parvus	
Metridia longa	Pseudocalanus minutus	

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***11. Lat. 23°08′ S., long. 41°34′ W.; South Atlantic; December 30, 1887; surface; 9 species**

Lucicutia flavicornis
Mecynocera clausi
Metridia gerlachei
Metridia lucens
Oithona linearis
Oithona similis
Paracalanus parvus
Pleuromamma gracilis
Pseudocalanus minutus

***12. Lat. 45°22′ S., long. 64°20′ W.; South Atlantic; January 15, 1888; surface; 13 species**

Calanus finmarchicus
Calanus tonsus
Centropages calaninus
Centropages furcatus
Centropages violaceus
Clausocalanus furcatus
Labidocera detruncata
Mecynocera clausi
Oithona similis
Oncaea minuta
Oncaea venusta
Paracalanus aculeatus
Temora discaudata

***13. Lat. 48°37′ S., long. 65°46′ W.; South Atlantic; January 16, 1888; surface; 19 species**

Acrocalanus gracilis
Calanus finmarchicus
Centropages calaninus
Corycaeus flaccus
Disseta palumboi
Eucalanus attenuatus
Labidocera nerii
Mecynocera clausi
Metridia gerlachei
Metridia lucens
Microsetella norvegica
Paracalanus aculeatus
Phaënna spinifera
Pleuromamma gracilis
Pontella securifer
Pseudocalanus minutus
Scolecithrix danae
Temora discaudata
Undinula darwinii

***14. Lat. 51°34′23″ S., long. 68°00′ W.; east of Patagonia; January 17, 1888; surface; 23 species**

Calocalanus pavo
Candacia simplex
Centropages calaninus
Copilia denticulata
Corycaeus clausi
Corycaeus dubius
Corycaeus lautus
Euchaeta marina
Farranula carinata
Farranula gibbula
Farranula gracilis
Labidocera detruncata
Lucicutia flavicornis
Mecynocera clausi
Metridia gerlachei
Metridia lucens
Microsetella norvegica
Paracalanus aculeatus
Paracalanus parvus
Pleuromamma gracilis
Pontella lobiancoi
Pseudocalanus minutus
Sapphirina pyrosomatis

***15. Lat. 22°54′ S., long. 77°10′ W.; South Pacific, off Chile; February 24, 1888; surface; 40 species**

Acartia danae
Acartia longiremis
Candacia bipinnata
Candacia bispinosa
Candacia simplex
Centropages calaninus
Centropages furcatus
Copilia mirabilis
Copilia quadrata
Corycaeus pumilus
Corycaeus speciosus
Euaetideus giesbrechti
Eucalanus attenuatus
Eucalanus elongatus
Eucalanus monachus
Euchaeta marina
Euchirella bella
Euchirella brevis
Euchirella venusta
Farranula gibbula
Gaetanus miles
Haloptilus longicornis
Heterostylites longicornis
Labidocera acutifrons
Labidocera nerii
Microsetella norvegica
Neocalanus robustior
Pareuchaeta grandiremis
Pontella tenuiremis
Pontellina plumata
Pontellopsis regalis
Pseudocalanus minutus
Sapphirina auronitens
Sapphirina nigromaculata
Sapphirina opalina
Scolecithrix danae
Temora discaudata
Undeuchaeta plumosa
Undinula caroli
Undinula vulgaris

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***16. Lat. 04°21′ S., long. 81°59′ W.; off coast of Peru; March 1, 1888; surface; 43 species**

Acrocalanus gibber
Acrocalanus gracilis
Acrocalanus monachus
Arietellus giesbrechti
Centropages calaninus
Centropages furcatus
Corycaeus agilis
Eucalanus attenuatus
Eucalanus elongatus
Eucalanus monachus
Euchaeta marina
Euchirella brevis
Euchirella rostrata
Gaetanus miles
Heterostylites longicornis
Labidocera acuta
Labidocera acutifrons
Labidocera detruncata
Labidocera euchaeta
Mecynocera clausi
Metridia lucens
Microsetella norvegica
Nannocalanus minor
Neocalanus gracilis
Neocalanus robustior
Oncaea venusta
Paracalanus aculeatus
Paracalanus parvus
Pareuchaeta grandiremis
Pareuchaeta hansenii
Phaënna spinifera
Pleuromamma gracilis
Pontella securifer
Pontellopsis armata
Pseudocalanus minutus
Pseudochirella obtusa
Rhincalanus cornutus
Scolecithrix danae
Temora discaudata
Temora longicornis
Temora stylifera
Undeuchaeta plumosa
Undinula vulgaris

***18. Lat. 01°03′ N., 80°15′ W.; off coast of Ecuador; March 3, 1888; surface; 17 species**

Disseta palumboi
Euchaeta marina
Gaetanus miles
Gaidius pungens
Haloptilus longicornis
Heterorhabdus papilliger
Labidocera detruncata
Lophothrix frontalis
Metridia princeps
Neocalanus gracilis
Paracalanus aculeatus
Pareuchaeta tonsa
Pleuromamma gracilis
Pleuromamma robusta
Pleuromamma xiphias
Scaphocalanus affinis
Scolecithrix danae

***19. Lat. 07°37′ N., long. 78°46′30″ W.; off west coast of Colombia; March 5, 1888; surface; 20 species**

Candacia bispinosa
Centropages calaninus
Clausocalanus arcuicornis
Clausocalanus furcatus
Euchaeta marina
Euchaeta spinosa
Euchirella brevis
Macrosetella gracilis
Mecynocera clausi
Metridia gerlachei
Microsetella norvegica
Oithona similis
Oncaea minuta
Oncaea venusta
Paracalanus parvus
Pleuromamma borealis
Pleuromamma gracilis
Pontella securifer
Undinula caroli
Undinula darwinii

***20. Lat. 07°57′ N., long. 78°55′ W.; Gulf of Panama; March 5, 1888; surface; 6 species**

Clausocalanus arcuicornis
Macrosetella gracilis
Mecynocera clausi
Oithona similis
Paracalanus parvus
Pseudocalanus minutus

***21. Lat. 08°05′ N., long. 78°51′ W.; Gulf of Panama; March 5, 1888; surface; 10 species**

Centropages furcatus
Macrosetella gracilis
Mecynocera clausi
Metridia gerlachei
Microsetella norvegica
Oithona similis
Oncaea venusta
Paracalanus parvus
Pleuromamma gracilis
Pseudocalanus minutus

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***22. At anchor off Perlas Islands; Gulf of Panama; March 5, 1888; surface; 12 species**

Centropages calaninus
Clausocalanus arcuicornis
Eucalanus attenuatus
Euchaeta spinosa
Metridia lucens
Microsetella norvegica
Oithona similis
Oncaea minuta
Oncaea venusta
Paracalanus parvus
Pleuromamma gracilis
Pseudocalanus minutus

***23. Lat. 8°44′ N., long. 79°09′ W.; Gulf of Panama; March 6, 1888; surface; 11 species**

Centropages calaninus
Centropages furcatus
Centropages violaceus
Clausocalanus arcuicornis
Clausocalanus furcatus
Microsetella norvegica
Oithona linearis
Paracalanus parvus
Pleuromamma gracilis
Pseudocalanus minutus
Undinula darwinii

***24. Lat. 06°44′ N., long. 80°27′ W.; south of Panama; March 31, 1888; surface; 23 species**

Acartia danae
Acrocalanus gracilis
Candacia bipinnata
Candacia bispinosa
Centropages calaninus
Centropages furcatus
Corycaeus clausi
Corycaeus flaccus
Corycaeus giesbrechti
Corycaeus longistylis
Corycaeus lubbockii
Corycaeus ovalis
Corycaeus speciosus
Euchaeta marina
Farranula gibbula
Lucicutia flavicornis
Lucicutia lucida
Oithona similis
Oncaea venusta
Paracalanus aculeatus
Pleuromamma gracilis
Pontellina plumata
Pseudocalanus minutus

***25. Lat. 04°18′ N., long. 85°14′ W.; northeast of Galápagos Islands; April 1, 1888; surface; 13 species**

Clausocalanus arcuicornis
Eucalanus attenuatus
Eucalanus elongatus
Mecynocera clausi
Metridia lucens
Microsetella norvegica
Oithona similis
Oithona spinirostris
Oncaea minuta
Paracalanus parvus
Pleuromamma gracilis
Pseudocalanus minutus
Sapphirina lactens

***26. Lat. 00°30′ N., long. 88°37′30″ W.; off Galápagos Islands; April 3, 1888; surface; 19 species**

Candacia aethiopica
Centropages calaninus
Clausocalanus arcuicornis
Clausocalanus furcatus
Corycaeus longistylis
Eucalanus attenuatus
Eucalanus crassus
Euchirella venusta
Haloptilus longicornis
Lophothrix frontalis
Mecynocera clausi
Metridia lucens
Microsetella norvegica
Oithona similis
Phyllopus bidentatus
Pontellina plumata
Scolecithrix danae
Scottocalanus securifrons
Undeuchaeta plumosa

***27. Lat. 00°24′ S., long. 89°06′ W.; off Galápagos Islands; April 4, 1888; surface; 50 species**

Arietellus armatus
Candacia aethiopica
Candacia simplex
Centropages calaninus
Centropages furcatus
Chirundina streetsi
Corycaeus agilis
Corycaeus speciosus
Eucalanus attenuatus
Eucalanus crassus
Eucalanus elongatus
Euchaeta marina
Euchirella brevis
Euchirella galeata
Euchirella messinensis

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***27. Lat. 00°24′ S., long. 89°06′ W.; off Galápagos Islands; April 4, 1888; surface; 50 species—Continued**

Euchirella rostrata
Haloptilus mucronatus
Haloptilus spiniceps
Labidocera acuta
Labidocera agilis
Labidocera detruncata
Labidocera minuta
Lophothrix frontalis
Mecynocera clausi
Nannocalanus minor
Oithona similis
Oncaea minuta
Paracalanus aculeatus
Paracalanus parvus
Pareuchaeta tumidula
Pleuromamma abdominalis
Pleuromamma gracilis
Pontella danae
Pontellina plumata
Pontellopsis regalis
Pontellopsis strenua
Rhincalanus cornutus
Sapphirina angusta
Sapphirina auronitens
Sapphirina opalina
Scolecithrix danae
Scottocalanus securifrons
Stephos perplexus
Temora discaudata
Temora longicornis
Temora stylifera
Undeuchaeta plumosa
Undinula caroli
Undinula darwinii
Undinula vulgaris

***29. Lat. 00°46′ S., long. 89°42′ W.; Galápagos Islands; April 15, 1888; surface; 8 species**

Calanus finmarchicus
Clausocalanus arcuicornis
Mecynocera clausi
Metridia lucens
Oithona linearis
Oithona similis
Paracalanus parvus
Pseudocalanus minutus

***30. Lat. 00°29′ S., long. 89°54′30″ W.; off Galápagos Islands; April 15, 1888; surface; 30 species**

Acrocalanus gracilis
Candacia aethiopica
Candacia bipinnata
Candacia bispinosa
Candacia simplex
Centropages calaninus
Clausocalanus furcatus
Corycaeus furcifer
Corycaeus longistylis
Corycaeus ovalis
Eucalanus attenuatus
Euchaeta marina
Farranula gibbula
Farranula gracilis
Haloptilus chierchiae
Labidocera detruncata
Labidocera minuta
Neocalanus gracilis
Paracalanus aculeatus
Paracalanus parvus
Pontella danae
Pontellina plumata
Pontellopsis regalis
Sapphirina auronitens
Scolecithrix danae
Scottocalanus securifrons
Temora discaudata
Temora longicornis
Temora stylifera
Undinula vulgaris

***31. Lat. 00°08′ S., long. 90°06′ W.; south of Galápagos Islands; April 15, 1888; surface; 28 species**

Acartia danae
Acrocalanus gracilis
Calanus cristatus
Calanus hyperboreus
Candacia aethiopica
Candacia norvegica
Candacia simplex
Corycaeus longistylis
Eucalanus attenuatus
Eucalanus elongatus
Eucalanus mucronatus
Euchaeta marina
Euchaeta spinosa
Labidocera detruncata
Labidocera euchaeta
Labidocera minuta
Labidocera wollastoni
Metridia longa
Nannocalanus minor
Oncaea minuta
Oncaea venusta
Pontella danae
Pontella securifer
Pontellopsis lubbockii
Pontellopsis villosa
Undinula caroli
Undinula darwinii
Undinula vulgaris

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B. TANNER INTERMEDIATE TOW-NET STATIONS, 1893 [1894] [9]

(California coast, Bering Sea, and coast of Washington)

***32. Lat. 37°29′ N., long. 123°01′20″ W.; off the coast of California; April 27, 1893; 100 fathoms to surface; 10 species**

Candacia aethiopica
Clausocalanus furcatus
Euchaeta marina
Labidocera detruncata
Lucicutia flavicornis
Mecynocera clausi
Paracalanus aculeatus
Paracalanus parvus
Pontellopsis regalis
Undeuchaeta major

***33. Lat. 60°22′ N., long. 171°42′ W.; Bering Sea; August 3, 1893; 25 fathoms to surface; 12 species**

Calanus cristatus
Calanus finmarchicus
Calanus hyperboreus
Corycaeus speciosus
Eucalanus attenuatus
Macrosetella gracilis
Mecynocera clausi
Microsetella norvegicus
Oithona similis
Paracalanus parvus
Pleuromamma gracilis
Pseudocalanus minutus

***34. Lat. 60°06′ N., long. 171°25′ W.; west of Alaska; August 3, 1893; 25 fathoms to surface; 19 species**

Acartia danae
Calanus finmarchicus
Centropages violaceus
Corycaeus agilis
Corycaeus catus
Corycaeus pumilus
Farranula rostrata
Metridia longa
Microsetella norvegica
Microsetella rosea
Oculosetella gracilis
Oithona plumifera
Oithona similis
Oncaea notopa
Oncaea venusta
Paracalanus parvus
Pleuromamma abdominalis
Pleuromamma gracilis
Pseudocalanus minutus

***35. Lat. 57°58′ N., long. 170°09′ W.; Bering Sea; August 4, 1893; 30 fathoms to surface; 13 species**

Calanus cristatus
Calanus finmarchicus
Clausocalanus furcatus
Corycaeus agilis
Corycaeus catus
Corycaeus pumilis
Mecynocera clausi
Metridia brevicauda
Microsetella norvegica
Oculosetella gracilis
Oithona similis
Paracalanus parvus
Pseudocalanus minutus

36. Lat. 59°39′ N., long. 173°53′ W.; west of Alaska; August 6, 1893; 43 fathoms to surface; 17 species

Acartia danae
Canthocalanus pauper
Centropages violaceus
Clausocalanus arcuicornis
Clytemnestra rostrata
Corycaeus catus
Heterorhabdus spinifrons
Labidocera detruncata
Lucicutia flavicornis
Mecynocera clausi
Metridia brevicauda
Microsetella rosea
Oncaea minuta
Oncaea venusta
Paracalanus parvus
Pleuromamma gracilis
Pseudocalanus minutus

37. Lat. 59°55′ N., long. 174°17′ W.; Bering Sea; August 6, 1893; 44 fathoms to surface; 3 species

Calanus cristatus
Calanus finmarchicus
Calanus helgolandicus

38. Lat. 54°45′ N., long. 169°06′ W.; Bering Sea; August 9, 1893; 40 fathoms to surface; 2 species

Calanus cristatus
Calanus finmarchicus

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[9] Townsend, C. H., Dredging and other records of the United States Fish Commission Steamer *Albatross*, with bibliography relative to the work of the vessel, U. S. Fish Comm. Rep. for 1900, p. 482, 1901.

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39. Lat. 56°10′ N., long. 163°26′ W.; off Alaska Peninsula; August 10, 1893; 30 fathoms to surface; 24 species

Acartia clausii
Acartia danae
Candacia aethiopica
Candacia curta
Candacia simplex
Canthocalanus pauper
Centropages violaceus
Clausocalanus arcuicornis
Corycaeus agilis
Corycaeus catus
Corycaeus dubius
Corycaeus longistylis
Corycaeus robustus
Euchirella brevis
Farranula carinata
Farranula rostrata
Mecynocera clausi
Nannocalanus minor
Oncaea minuta
Oncaea similis
Oncaea venusta
Paracalanus parvus
Phaënna spinifera
Sapphirina auronitens

41. Lat. 54°38′ N., long. 175°27′ W.; north of Aleutian Islands; August 20, 1893; 125 fathoms to surface; 37 species

Acartia danae
Acrocalanus gracilis
Calanus cristatus
Calanus finmarchicus
Candacia aethiopica
Candacia bipinnata
Candacia bispinosa
Candacia norvegica
Candacia simplex
Canthocalanus pauper
Centropages calaninus
Centropages violaceus
Clausocalanus furcatus
Corycaeus catus
Corycaeus flaccus
Corycaeus longistylis
Corycaeus pacificus
Corycaeus pumilus
Corycaeus speciosus
Eucalanus attenuatus
Eucalanus elongatus
Euchaeta spinosa
Farranula carinata
Farranula rostrata
Lubbockia aculeata
Mecynocera clausi
Metridia longa
Metridia lucens
Microsetella rosea
Nannocalanus minor
Oncaea conifera
Oncaea venusta
Paracalanus aculeatus
Pareuchaeta erebi
Pleuromamma gracilis
Pseudocalanus minutus
Sapphirina auronitens

42. Lat. 55°46′ N., long. 172°44′ W.; north of Aleutian Islands; August 21, 1893; 250 fathoms to surface; 24 species

Acrocalanus gracilis
Calanus cristatus
Calanus finmarchicus
Candacia bispinosa
Candacia simplex
Canthocalanus pauper
Corycaeus flaccus
Corycaeus longistylis
Eucalanus attenuatus
Euchaeta marina
Euchaeta spinosa
Farranula carinata
Gaidius tenuispinus
Heterorhabdus norvegicus
Metridia longa
Metridia lucens
Microsetella rosea
Oculosetella gracilis
Oithona similis
Oncaea similis
Oncaea venusta
Paracalanus parvus
Pareuchaeta gracilis
Pleuromamma gracilis

43. Lat. 54°59′ N., long. 171°49′ W.; north of Aleutian Islands; August 22, 1893; 100 fathoms to surface; 16 species

Calanus cristatus
Candacia bipinnata
Centropages violaceus
Corycaeus flaccus
Corycaeus longistylis
Corycaeus speciosus
Eucalanus attenuatus
Eucalanus elongatus
Farranula carinata
Farranula gibbula
Farranula rostrata
Macrosetella gracilis
Microsetella rosea
Nannocalanus minor
Oithona plumifera
Oncaea similis

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44. Lat. 54°44′ N., long. 165°42′ W.; north of Aleutian Islands; September 1, 1893; 50 fathoms to surface; 22 species

Acartia danae	Euchirella curticauda	Neocalanus robustior
Calanus cristatus	Farranula carinata	Oithona plumifera
Corycaeus catus	Farranula gibbula	Oithona similis
Corycaeus longistylis	Lubbockia aculeata	Oncaea venusta
Corycaeus speciosus	Lucicutia flavicornis	Paracalanus parvus
Eucalanus attenuatus	Mecynocera clausi	Sapphirina auronitens
Eucalanus elongatus	Microsetella rosea	
Euchaeta marina	Nannocalanus minor	

45. Lat. 48°14′30″ N., long. 122°58′ W.; off coast of Washington; April 30, 1894; 4 fathoms to surface; 9 species

Acrocalanus gracilis	Euchaeta marina	Microsetella rosea
Clausocalanus arcuicornis	Farranula gibbula	Oithona similis
Eucalanus elongatus	Microsetella norvegica	Oncaea similis

C. TOWNSEND INTERMEDIATE AND SURFACE TOW-NET STATIONS, 1895[10]

(Bering Sea)

46. Lat. 55°06′ N., long. 169°08′ W.; Bering Sea; August 5, 1895; 200 fathoms and surface; 13 species

Acartia danae	Eucalanus attenuatus	Oithona similis
Calanus cristatus	Euchaeta marina	Oncaea venusta
Calanus finmarchicus	Farranula gibbula	Pseudocalanus minutus
Calocalanus styliremis	Farranula rostrata	
Corycaeus lubbockii	Oithona linearis	

47. Lat. 55°36′ N., long. 170°45′ W.; Bering Sea; August 7, 1895; 100 fathoms and surface; 11 species

Acartia danae	Lubbockia aculeata	Oithona similis
Clausocalanus furcatus	Microsetella rosea	Oncaea venusta
Farranula gibbula	Nannocalanus minor	Paracalanus parvus
Farranula rostrata	Oithona linearis	

48. Lat. 55°10′ and 11′ N., long. 170°56′ and 171°13′ W; Bering Sea; August 7, 1895; 150 fathoms, 1 fathom, and surface; 21 species

Acrocalanus gracilis	Eucalanus attenuatus	Labidocera acuta
Calanus cristatus	Eucalanus elongatus	Metridia longa
Calanus finmarchicus	Eucalanus subcrassus	Phaënna spinifera
Candacia simplex	Euchaeta marina	Pleuromamma gracilis
Centropages furcatus	Euchaeta spinosa	Rhincalanus cornutus
Corycaeus lubbocki	Farranula rostrata	Temora stylifera
Corycaeus speciosus	Gaidus tenuispinus	Undinula vulgaris

[10] Townsend, C. H., Dredging and other records of the United States Fish Commission Steamer *Albatross*, with bibliography relative to the work of the vessel. U. S. Fish Commission Report for 1900, pp. 433, 484, 1901.

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49. Lat. 55°53′ N., long. 171°40′ W.; Bering Sea; August 8, 1895; 200 fathoms and 10 feet; 26 species

Acartia danae	Corycaeus speciosus	Metridia longa
Calanus cristatus	Eucalanus attenuatus	Microsetella norvegica
Calanus finmarchicus	Eucalanus elongatus	Neocalanus gracilis
Candacia bipinnata	Eucalanus mucronatus	Oithona similis
Candacia bispinosa	Farranula gibbula	Oncaea venusta
Candacia simplex	Farranula rostrata	Pleuromamma abdominalis
Canthocalanus pauper	Gaetanus armiger	
Centropages calaninus	Heterorhabdus papilliger	Sapphirina auronitens
Clausocalanus arcuicornis	Lucicutia tenuicauda	Sapphirina opalina

50. Lat. 55°44′ N., long. 171°17′ W.; Bering Sea; August 8, 1895; 20 feet; 5 species

Calanus cristatus	Centropages calaninus	Metridia longa
Calanus finmarchicus	Farranula rostrata	

51. Lat. 56°15′ N., long. 172°35′ W; Bering Sea; August 10, 1895; 43 fathoms; 12 species

Acartia danae	Eucalanus elongatus	Oithona similis
Calanus cristatus	Farranula gibbula	Oncaea minuta
Candacia simplex	Farranula rostrata	Paracalanus parvus
Canthocalanus pauper	Metridia longa	Scolecithricella bradyi

52. Lat. 56°13′ N., long. 172°20′ W.; Bering Sea; August 10, 1895; 50 fathoms and surface; 26 species

Acartia danae	Corycaeus speciosus	Mecynocera clausi
Acrocalanus gracilis	Eucalanus attenuatus	Metridia longa
Calanus cristatus	Eucalanus elongatus	Microsetella rosea
Calanus finmarchicus	Euchaeta marina	Oithona linearis
Candacia aethiopica	Euchaeta spinosa	Oncaea venusta
Candacia simplex	Farranula gibbula	Phaënna spinifera
Canthocalanus pauper	Farranula rostrata	Pseudocalanus minutus
Clausocalanus furcatus	Heterorhabdus papilliger	Scolecithrix danae
Corycaeus longistylis	Lucicutia flavicornis	

53. Lat. 55°23′ N., long. 170°31′ W.; Bering Sea; August 11, 1895; 48 fathoms and surface; 18 species

Acartia danae	Corycaeus speciosus	Nannocalanus minor
Acrocalanus gracilis	Euchaeta marina	Oithona linearis
Candacia aethiopica	Farranula carinata	Oncaea venusta
Centropages calaninus	Farranula gibbula	Pseudocalanus minutus
Centropages violaceus	Farranula rostrata	Scolecithrix danae
Clausocalanus arcuicornis	Microsetella norvegica	Spinocalanus abyssalis

54. Lat. 54°54′ N., long. 168°59′ W.; Bering Sea; August 12, 1895; 25 fathoms and surface; 18 species

Acartia danae	Euchaeta marina	Paracalanus aculeatus
Calocalanus pavo	Farranula gibbula	Paracalanus parvus
Candacia aethiopica	Farranula rostrata	Phaënna spinifera
Candacia varicans	Mecynocera clausi	Sapphirina auronitens
Copilia denticulata	Microsetella rosea	Sapphirina lactens
Corycaeus catus	Oithona linearis	Scolecithrix danae

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55. Latitude and longitude not given; between stations 54 and 57; Bering Sea; August 13, 1895; 30 fathoms; 22 species

Acartia danae
Canthocalanus pauper
Centropages violaceus
Corycaeus flaccus
Corycaeus longistylis
Corycaeus lubbockii
Eucalanus attenuatus
Euchaeta marina
Farranula carinata
Farranula gibbula
Farranula rostrata
Lucicutia flavicornis
Microsetella rosea
Nannocalanus minor
Neocalanus gracilis
Oithona linearis
Oithona similis
Oncaea similis
Paracalanus parvus
Pseudocalanus minutus
Sapphirina auronitens
Scolecithrix danae

56. Latitude and longitude not given; between stations 54 and 57; Bering Sea; August 18, 1895; 200 fathoms and surface; 3 species

Farranula rostrata
Gaetanus miles
Scolecithrix danae

57. Lat. 54°17′ N., long. 163°53′30″ W.; Bering Sea; August 19, 1895; 50 fathoms and surface; 29 species

Acartia danae
Calanus cristatus
Calanus finmarchicus
Calanus helgolandicus
Candacia aethiopica
Candacia simplex
Canthocalanus pauper
Centropages calaninus
Centropages violaceus
Clausocalanus arcuicornis
Corycaeus longistylis
Corycaeus lubbockii
Corycaeus speciosus
Eucalanus attenuatus
Eucalanus elongatus
Euchaeta marina
Farranula carinata
Farranula gibbula
Farranula gracilis
Farranula rostrata
Lucicutia flavicornis
Metridia longa
Microsetella rosea
Nannocalanus minor
Oithona similis
Oncaea minuta
Oncaea venusta
Paracalanus parvus
Scolecithrix danae

58. Latitude and longitude not given; between stations 57 and 59; Bering Sea; August 19, 1895; surface; 8 species

Farranula carinata
Farranula gibbula
Farranula gracilis
Farranula rostrata
Oithona similis
Paracalanus aculeatus
Sapphirina auronitens
Scolecithrix danae

59. Haul apparently repeated; location of first trial not stated, second trial latitude 55°19′ N., longitude 168°11′ W.; and lat. 55°11′ N., long. 167°56′ W., Bering Sea; August 20, 1895; 200 fathoms and surface; 27 species

Acartia danae
Candacia simplex
Canthocalanus pauper
Centropages calaninus
Centropages violaceus
Corycaeus flaccus
Corycaeus furcifer
Corycaeus lautus
Corycaeus longistylis
Corycaeus lubbockii
Eucalanus monachus
Euchaeta marina
Farranula carinata
Farranula gibbula
Farranula gracilis
Farranula rostrata
Lucicutia flavicornis
Metridia longa
Neocalanus gracilis
Oithona linearis
Oithona similis
Oncaea venusta
Paracalanus parvus
Phaënna spinifera
Pseudocalanus minutus
Sapphirina auronitens
Scolecithrix danae

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60. Latitude and longitude not given; same day as, and near station 59; Bering Sea; August 20, 1895; 70 fathoms and surface; 30 species

Acartia danae
Calanus cristatus
Candacia aethiopica
Candacia simplex
Canthocalanus pauper
Centropages calaninus
Clausocalanus arcuicornis
Copilia denticulata
Corycaeus catus
Corycaeus flaccus
Corycaeus furcifer
Corycaeus lautus
Corycaeus longistylis
Corycaeus lubbockii
Euchaeta marina
Farranula carinata
Farranula gibbula
Farranula gracilis
Farranula rostrata
Lucicutia flavicornis
Metridia longa
Neocalanus gracilis
Oithona similis
Oithona spinirostris
Oncaea venusta
Pleuromamma abdominalis
Pleuromamma xiphias
Pseudocalanus minutus
Sapphirina auronitens
Scolecithrix danae

61. Latitude and longitude not given; Bering Sea; August 21, 1895; 50 fathoms and surface; 10 species

Candacia simplex
Canthocalanus pauper
Corycaeus typicus
Farranula gibbula
Farranula rostrata
Lucicutia flavicornis
Oithona linearis
Paracalanus aculeatus
Pseudocalanus minutus
Scolecithrix danae

62. Latitude and longitude not given; Bering Sea; August 21, 1895; 30 fathoms and surface; 21 species

Acartia danae
Candacia bispinosa
Cephalophanes refulgens
Clausocalanus arcuicornis
Corycaeus longistylis
Corycaeus lubbockii
Corycaeus typicus
Farranula carinata
Farranula gibbula
Farranula gracilis
Farranula rostrata
Mecynocera clausi
Microsetella rosea
Oithona similis
Oncaea minuta
Oncaea similis
Oncaea venusta
Paracalanus parvus
Pseudocalanus minutus
Sapphirina auronitens
Scolecithrix danae

63. Latitude and longitude not given; Bering Sea; August 22, 1895; 20 fathoms and surface; 32 species

Acartia danae
Acartia longiremis
Aetideus armatus
Candacia aethiopica
Candacia bispinosa
Centropages calaninus
Centropages violaceus
Clausocalanus arcuicornis
Corycaeus flaccus
Corycaeus lautus
Corycaeus longistylis
Corycaeus lubbockii
Corycaeus ovalis
Corycaeus typicus
Farranula carinata
Farranula gibbula
Farranula gracilis
Farranula rostrata
Lucicutia flavicornis
Mecynocera clausi
Microsetella norvegica
Microsetella rosea
Oithona linearis
Oithona similis
Oncaea minuta
Oncaea venusta
Paracalanus parvus
Pleuromamma gracilis
Pleuromamma robusta
Rhincalanus cornutus
Sapphirina auronitens
Undinula darwinii

64–474. Stations included in this series and recorded under various species in the text are a part of the so-called Pacific Cable Survey of 1891 and appear in regular order with the hydrographic stations, 2718–3129, to which they correspond (see section E of these lists, p. 423)

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D. DREDGING AND TRAWLING STATIONS, 1884–1909 [11]

(ATLANTIC AND PACIFIC)

2195. Lat. 39°44′ N., long. 70°03′ W.; off Cape Hatteras; August 5, 1884; surface; 22 species

Calanus hyperboreus
Candacia pachydactyla
Corycaeus speciosus
Euchirella rostrata
Gaetanus kruppii
Gaidius brevispinus
Gaidius tenuispinus
Labidocera acutifrons
Lucicutia curta
Lucicutia grandis
Lucicutia ovalis
Metridia longa
Neocalanus gracilis
Oithona robusta
Oithona similis
Paracalanus parvus
Pareuchaeta norvegica
Pleuromamma gracilis
Pleuromamma robusta
Pontellina plumata
Scolecithrix danae
Undeuchaeta plumosa

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[11] Smith, Sanderson, Lists of dredging stations in North American waters from 1867 to 1887, Ann. Rep. Commissioner of Fish and Fisheries for 1886 [1888].—Townsend, C. H., Dredging and other records of the United States Fish Commission Steamer *Albatross*, with bibliography relative to the work of the vessel, U. S. Fish. Comm. Rep. for 1900 [1901]; Records of the dredging and other collecting stations of the U. S. Fish Commission Steamer *Albatross* in 1901 and 1902, U. S. Fish Comm. Rep. for 1902 [1903].—Fassett, Harry C., Records of the dredging and other collecting and hydrographic stations of the U. S. Fisheries Steamer *Albatross* in 1903, U. S. Fish Comm. Rep. for 1903 [1904]; Dredging and hydrographic records of the U. S. Fisheries Steamer *Albatross* for 1904 and 1905, Bur. Fish. Doc. No. 604, 1906; Dredging and hydrographic records of the U. S. Fisheries Steamer *Albatross* for 1906, Bur. Fish. Doc. No. 621, 1907; Dredging and hydrographic records of the U. S. Fisheries Steamer *Albatross* during the Philippine Expedition, 1907–1910, Bur. Fish. Doc. No. 741, 1910.

[At some of the listed Philippine stations, the depth of the tow or haul does not correspond with the information in the published dredging records. Some important data entered on the original labels of at least 17 plankton samples seem to have been omitted from those records. The stations in question together with date and unpublished data are:

Station			*Unpublished data taken from original label of sample.*
D. 5301	1908:	Aug. 8;	2′ o. p., surf., time not stated.
D. 5312		Nov. 4;	K. 2, surf., time not stated.
D. 5320.		Nov. 6;	also 10 ft. cir. net [int. 4 or 5] at 3 p. m. for 45 mins. at 800 fms
D. 5338.		Dec. 20;	bottle label gives depth of tow as 10 ft.
D. 5348.		Dec. 27;	K. 2, surf., 30 mins.
D. 5358.	1909:	Jan. 7;	K. 2, surf., 15 mins.
D. 5382.		Mar. 6;	K. 2, 10 ft., time not stated.
D. 5386.		Mar. 9;	K. 2, 10 ft., time not stated.
D. 5388.		Mar. 11;	K. 2, 15 ft., 20 mins.
D. 5413.		Mar. 24;	K. 2, 15 ft., time not stated.
D. 5422.		Mar. 30;	K. 2, 15 mins., depth not stated.
Sabtán Island.		June;	K. 2, surf., set in tidal current, 7–9 p. m.
D. 5489.		July 31;	K. 5, tow was made at 7:30 p. m.
D. 5507.		Aug. 5;	K. 5, K. 2, 10 ft., 20 mins, 1:30 p. m.
D. 5601.		Nov. 13;	K. 2, below surf., 20 mins.
D. 5647.		Dec. 16;	K. 2, below surf., 1 hr., 10 mins.
D. 5651.		Dec. 17;	K. 2, surf., 50 mins.

Twenty-two additional Philippine stations are recorded in lists of identifications (p. 410 *et seq.*) showing that townet hauls were made at each of them, although no indication of the fact appears in the published station records cited above. These stations are a part of the foregoing series and are numbered: 5267, 5284, 5285, 5296, 5341, 5346, 5349, 5357, 5399, 5410, 5412, 5415, 5423, 5424, 5425, 5460, 5538, 5640, 5646, 5655, 5657, 5661.

There are undoubtedly other stations for which the published data are incomplete, but these may never be discovered, as Dr. Wilson, when he subdivided a sample, wrote new labels for the component parts, in most cases not retaining the original field label.—W. L. S.]

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2219. Lat. 39°46′22″ N., long. 69°29′ W.; off New Jersey coast; August 23, 1884; surface; 7 species

Augaptilus longicaudatus
Euaugaptilus filigerus
Euchirella rostrata
Pareuchaeta norvegica
Scaphocalanus magnus
Temora turbinata
Xanthocalanus greeni

2236. Lat. 39°11′ N., long. 72°08′30″ W.; south of Long Island; September 13, 1884; surface; 10 species

Candacia armata
Centropages bradyi
Euchaeta marina
Heterostylites longicornis
Metridia brevicauda
Metridia longa
Metridia lucens
Nannocalanus minor
Pareuchaeta norvegica
Rhincalanus cornutus

2396. Lat. 28°34′ N., long. 86°48′ W.; Gulf of Mexico; March 13, 1885; surface; 14 species

Anomalocera manicauda
Calanopia elliptica
Calanopia minor
Caligus rapax
Cryptopontius brevifurcatus
Eucalanus attenuatus
Euchaeta marina
Pontella lobiancoi
Pontella meadii
Sapphirina lactens
Sapphirina opalina
Scolecithrix danae
Temora longicornis
Temora stylifera

2563. Lat. 39°18′30″ N., long. 71°23′30″ W.; off coast of Delaware; August 11, 1885; 1 species (*cf.* p. 334)

Scolecithricella ovata

2770. Lat. 48°37′ S., long. 65°46′ W., off Santa Cruz Territory, Argentine Patagonia; January 16, 1888; surface; 2 species

Calanus finmarchicus
Drepanopus forcipatus

2792. Lat. 00°37′ S.; long. 81°00′ W.; off coast of Ecuador; March 2, 1888; surface; 2 species

Eucalanus attenuatus
Temora stylifera

2806. Lat. 00°30′ N., long. 88°37′30″ W.; Galápagos Islands; April 3, 1888; surface; 9 species

Corycaeus agilis
Corycaeus catus
Corycaeus speciosus
Farranula gracilis
Labidocera acutifrons
Oithona robusta
Oithona similis
Oncaea venusta
Sapphirina auronitens

2807. Lat. 00°24′ S., long. 89°06′ W.; off Galápagos Islands; April 4, 1888; surface 1 species

Neocalanus robustior

2818. Lat. 00°29′ S., long. 89°54′30″ W.; off Galápagos Islands; April 15, 1888; surface; 1 species

Corycaeus clausi

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2859. Lat. 55°20′ N., long. 136°20′ W.: Gulf of Alaska; August 29, 1888; surface; 11 species

Calanus cristatus
Calanus finmarchicus
Eucalanus attenuatus
Gaidius brevispinus
Lophothrix frontalis
Megacalanus princeps
Metridia longa
Neocalanus robustior
Pareuchaeta gracilis
Pareuchaeta tonsa
Pleuromamma abdominalis

2861. Lat. 51°14′ N., long. 129°50′ W.; Sitka to Columbia River; August 31, 1888; surface; 7 species

Calanus cristatus
Calanus finmarchicus
Euchaeta spinosa
Gaidius brevispinus
Metridia longa
Pareuchaeta erebi
Pseudeuchaeta brevicauda

2937. Lat. 33°04′30″ N., long. 117°42′ W.; off southern California; February 4, 1889; surface; 3 species

Pontellopsis armata
Pontellopsis sinuata
Sapphirina angusta

3226. Lat. 55°01′ N., long. 167°25′ W.; Bering Sea; May 23, 1890; surface; 1 species

Lepeophtheirus parviventris

3382. Lat. 6°21′ N., long. 80°41′ W.; off Panama; March 7, 1891; surface; 4 species

Centraugaptilus horridus
Eucalanus elongatus
Rhincalanus nasutus
Undeuchaeta major

3412. Lat. 1°23′ N., long. 91°43′ W.; off Galápagos Islands; April 4, 1891; surface; 5 species

Candacia bispinosa
Eucalanus elongatus
Euchaeta marina
Labidocera acuta
Pontella danae

3602. Lat. 56°32′ N., long. 172°40′ W., Bering Sea; August 10, 1895; surface; lat. 55°52′ N., long. 171°4′ W., Bering Sea; August 11, 1895; 3 feet below surface; 6 species [13]

Calanus cristatus
Calanus finmarchicus
Calanus hyperboreus
Eucalanus elongatus
Metridia longa
Pseudophaënna typica

3681. Lat. 28°23′ N., long. 126°57′ W.; off San Francisco; August 27, 1899; surface; 4 species

Paracalanus parvus
Pseudocalanus minutus
Sapphirina metallina
Undinula darwinii

3683. Lat. 9°57′ N., long. 137°47′ W.; north of Marquesas Islands; September 5, 1899; surface; 4 species

Acrocalanus monachus
Centropages furcatus
Dysgamus pacificus
Pontella danae

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[13] [It cannot now be determined whether this particular tow was made at a dredging or hydrographic station. The two stations of this number are about one day and less than 50 miles apart in the Bering Sea. The position of the dredging station is given first, followed by that of the hydrographic station and the species identified by Dr. Wilson from the material collected at station 3602.—W. L. S.]

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3694. Lat. 12°43′ N., long. 179°50′ E.; Tonga to Ellice Islands; December 21, 1899; surface; 2 species

Euchaeta spinosa
Labidocera acutifrons

3696. Off Honshu Island, Japan; May 5, 1900; surface; 2 species

Calanus finmarchicus
Centropages typicus

3705. Off Honshu Island, Japan; May 7, 1900; surface; 3 species

Farranula rostrata
Paracalanus parvus
Pseudocalanus minutus

3712. Off Honshu Island, Japan; May 10, 1900; surface; 10 species

Eucalanus attenuatus
Euchaeta marina
Euchaeta spinosa
Euchirella bitumida
Euchirella curticauda
Heterorhabdus clausii
Oncaea minuta
Paracalanus parvus
Pleuromamma xiphias
Rhincalanus nasutus

3716. Off Honshu Island, Japan; May 11, 1900; surface; 2 species

Pareuchaeta norvegica
Rhincalanus nasutus

3765. Off Honshu Island, Japan; May 22, 1900; surface; 15 species

Acrocalanus monachus
Candacia simplex
Eucalanus attenuatus
Eucalanus monachus
Euchaeta hebes
Euchaeta marina
Euchaeta spinosa
Farranula rostrata
Nannocalanus minor
Oithona robusta
Oithona similis
Oncaea minuta
Paracalanus parvus
Pleuromamma gracilis
Rhincalanus cornutus

3781. Northern Pacific, off Kamchatka; June 23, 1900; surface; 1 species

Sapphirina opalina

3782. Northern Pacific, off Kamchatka; June 23, 1900; surface; 8 species

Acartia longiremis
Calocalanus pavo
Corycaeus clausi
Corycaeus lautus
Corycaeus speciosus
Oncaea conifera
Sapphirina metallina
Undinula darwinii

3789. Lat. 48°21′45″ N., long. 124°52′30″ W.; off Washington; April 30, 1901; surface; 12 species

Acrocalanus gibber
Calocalanus pavo
Canthocalanus pauper
Centropages calaninus
Corycaeus ovalis
Corycaeus speciosus
Euchaeta marina
Farranula gracilis
Farranula rostrata
Nannocalanus minor
Pseudocalanus minutus
Sapphirina scarlata

3791. Lat. 33°08′45″ N., long. 130°41′ W.; off California; March 14, 1902; surface; 2 species

Euchaeta marina
Labidocera acutifrons

3797. Lat. 31°55′ N., long. 136°00′ W.; off Hawaiian Islands; March 17, 1902; surface; 2 species

Farranula carinata
Farranula rostrata

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3799. Lat. 29°22′ N., long. 139°31′ W.; Hawaiian Islands; March 18, 1902; 100–0 fathoms; 100 species

Acartia danae
Acartia longiremis
Acrocalanus gibber
Acrocalanus gracilis
Acrocalanus longicornis
Aegisthus mucronatus
Calocalanus pavo
Candacia aethiopica
Candacia bipinnata
Candacia bispinosa
Candacia longimana
Candacia norvegica
Candacia simplex
Centropages calaninus
Centropages furcatus
Chirundina streetsi
Clausocalanus arcuicornis
Clausocalanus furcatus
Clytemnestra scutellata
Copilia quadrata
Corycaeus agilis
Corycaeus crassiusculus
Corycaeus flaccus
Corycaeus furcifer
Corycaeus lautus
Corycaeus limbatus
Corycaeus longistylis
Corycaeus speciosus
Corycaeus subtilis
Corycaeus typicus
Euaetidius giesbrechti
Eucalanus attenuatus
Euchaeta marina
Euchirella brevis
Euchirella curticauda
Euchirella intermedia
Euchirella messinensis
Farranula gibbula
Farranula rostrata
Gaetanus armiger
Gaetanus kruppii
Gaetanus latifrons
Gaidus tenuispinus
Haloptilus longicornis
Haloptilus ornatus
Haloptilus oxycephalus
Haloptilus spiniceps
Haloptilus tenuis
Heteramalla dubia
Heterorhabdus papilliger
Labidocera acutifrons
Labidocera detruncata
Lucicutia clausii
Lucicutia curta
Lucicutia flavicornis
Lucicutia longicornis
Lucicutia tenuicauda
Macrosetella gracilis
Mecynocera clausi
Megacalanus princeps
Metridia longa
Mormonilla phasma
Nannocalanus minor
Neocalanus gracilis
Neocalanus robustior
Neocalanus tenuicornis
Oithona linearis
Oithona similis
Oithona spinirostris
Oncaea conifera
Oncaea minuta
Pachyptilus abbreviatus
Paracalanus parvus
Pareuchaeta gracilis
Phaënna spinifera
Pleuromamma abdominalis
Pleuromamma gracilis
Pleuromamma piseki
Pleuromamma robusta
Pleuromamma xiphias
Pontellina plumata
Pseudocalanus minutus
Sapphirina angusta
Sapphirina auronitens
Sapphirina metallina
Sapphirina nigromaculata
Sapphirina opalina
Sapphirina salpae
Sapphirina scarlata
Scaphocalanus echinatus
Scaphocalanus subbrevicornis
Scolecithricella auropecten
Scolecithricella bradyi
Scolecithricella dentata
Scottocalanus thomasi
Spinocalanus abyssalis
Temora stylifera
Undeuchaeta major
Undeuchaeta plumosa
Undinula vulgaris

3800. Lat. 28°23′ N., long. 141°41′05″ W.; Hawaiian Islands; March 19, 1902; 100–0 fathoms; 23 species

Candacia bipinnata
Candacia simplex
Centropages furcatus
Corycaeus longistylis
Corycaeus speciosus
Eucalanus attenuatus
Euchaeta spinosa
Euchirella curticauda
Euchirella messinensis
Farranula rostrata
Gaetanus pileatus
Lucicutia tenuicauda
Macrosetella gracilis
Mecynocera clausi
Neocalanus gracilis
Neocalanus robustior
Neocalanus tenuicornis
Oncaea minuta
Phaënna spinifera
Pleuromamma gracilis
Pleuromamma xiphias
Pseudocalanus minutus
Undeuchaeta plumosa

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3803. Lat. 25°39′45″ N., long. 147°41′45″ W.; Hawaiian Islands; March 21, 1902; 50–0 fathoms; 5 species

Haloptilus spiniceps
Lucicutia tenuicauda
Neocalanus robustior
Paracalanus parvus
Phaënna spinifera

3807. Lat. 22°43′15″ N., long. 154°17′30″ W.; Hawaiian Islands; March 23, 1902; 50–0 fathoms; 1 species

Pontella atlantica

3822. South of Molokai Island, Hawaiian Islands; April 1, 1902; surface; 7 species

Corycaeus latus
Labidocera acutifrons
Labidocera detruncata
Paracalanus parvus
Pontella atlantica
Pontella tenuiremis
Pontellopsis armata

3829. South of Molokai Island, Hawaiian Islands; April 2, 1902; surface; 53 species

Acartia danae
Acartia longiremis
Acartia negligens
Acrocalanus gibber
Acrocalanus gracilis
Acrocalanus monachus
Calocalanus pavo
Candacia aethiopica
Candacia armata
Centropages gracilis
Copilia mirabilis
Copilia quadrata
Corycaeus catus
Corycaeus latus
Corycaeus lautus
Corycaeus limbatus
Corycaeus longistylis
Corycaeus pumilus
Corycaeus robustus
Corycaeus speciosus
Corycaeus subtilis
Dysgamus ariommus
Dysgamus pacificus
Eucalanus crassus
Eucalanus mucronatus
Euchaeta marina
Euchirella curticauda
Euchirella intermedia
Farranula carinata
Farranula gibbula
Farranula rostrata
Labidocera acutifrons
Nannocalanus minor
Neocalanus gracilis
Neocalanus robustior
Oithona similis
Oncaea minuta
Oncaea ornata
Oncaea similis
Paracalanus parvus
Pareuchaeta incisa
Phaënna spinifera
Pontella securifer
Pontellina plumata
Pseudocalanus minutus
Sapphirina angusta
Sapphirina auronitens
Sapphirina ovato-lanceolata
Scolecithricella bradyi
Scolecithrix danae
Undinula caroli
Undinula darwinii
Undinula vulgaris

3834. South of Molokai Island, Hawaiian Islands; April 2, 1902; surface; 18 species

Acartia longiremis
Candacia bispinosa
Candacia simplex
Euchaeta marina
Farranula carinata
Haloptilus acutifrons
Lubbockia aculeata
Lubbockia squillimana
Lucicutia flavicornis
Lucicutia tenuicauda
Neocalanus gracilis
Oncaea minuta
Paracalanus parvus
Pseudocalanus minutus
Sapphirina auronitens
Scolecithricella bradyi
Undinula caroli
Undinula vulgaris

3839. South of Molokai Island, Hawaiian Islands; April 4, 1902; surface; 1 species

Candacia simplex

3864. Pailolo Channel, Hawaiian Islands; April 10, 1902; surface; 1 species

Pontella atlantica

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3867. Off Mokuhooniki, Hawaiian Islands; April 10, 1902; surface; 23 species

Acartia longiremis
Candacia aethiopica
Candacia bispinosa
Eucalanus attenuatus
Euchaeta marina
Euchaeta media
Euchaeta pubera
Farranula gibbula
Farranula rostrata
Labidocera acutifrons
Labidocera detruncata
Nannocalanus minor
Neocalanus gracilis
Oncaea minuta
Paracalanus parvus
Pleuromamma abdominalis
Pleuromamma gracilis
Pseudocalanus minutus
Sapphirina opalina
Scolecithricella bradyi
Scolecethrix danae
Undinula caroli
Undinula vulgaris

3878. South of Lanai Island, Hawaiian Islands; April 14, 1902; surface; 58 species

Acartia danae
Acartia longiremis
Acartia negligens
Acrocalanus gracilis
Arietellus armatus
Calocalanus pavo
Candacia aethiopica
Candacia bispinosa
Candacia longimana
Candacia norvegica
Candacia simplex
Centropages calaninus
Copilia mirabilis
Corycaeus agilis
Corycaeus crassiusculus
Corycaeus flaccus
Corycaeus latus
Corycaeus longistylis
Corycaeus robustus
Corycaeus speciosus
Eucalanus elongatus
Euchaeta marina
Euchaeta spinosa
Euchirella intermedia
Farranula rostrata
Heterorhabdus papilliger
Labidocera acuta
Labidocera acutifrons
Labidocera albatrossi
Labidocera detruncata
Labidocera wollastoni
Macrosetella gracilis
Neocalanus gracilis
Neocalanus robustior
Neocalanus tenuicornis
Oncaea minuta
Oncaea notopa
Paracalanus parvus
Phaënna spinifera
Pleuromamma abdominalis
Pleuromamma gracilis
Pleuromamma piseki
Pleuromamma xiphias
Pontella fera
Pontella tenuiremis
Pontellina plumata
Pontellopsis albatrossi
Pontellopsis armata
Pontellopsis regalis
Pseudocalanus minutus
Sapphirina gemma
Sapphirina metallina
Sapphirina ovatolanceolata
Scolecithricella bradyi
Scolecithrix danae
Undinula caroli
Undinula darwinii
Undinula vulgaris

3898. Pailolo Channel, Hawaiian Islands; April 29, 1902; surface; 1 species

Pontella tenuiremis

3901. Off Mokuhooniki, Hawaiian Islands; April 29, 1902; surface; 51 species

Acartia danae
Acrocalanus gracilis
Acrocalanus longicornis
Acrocalanus monachus
Calocalanus pavo
Candacia aethiopica
Candacia bipinnata
Candacia bispinosa
Candacia norvegica
Canthocalanus pauper
Centropages furcatus
Centropages violaceus
Clausocalanus arcuicornis
Copilia quadrata
Corycaeus agilis
Corycaeus limbatus
Corycaeus longistylis
Corycaeus pacificus
Corycaeus pumilus
Corycaeus robustus
Corycaeus typicus
Eucalanus elongatus
Eucalanus mucronatus
Euchaeta marina
Farranula carinata
Farranula concinna
Farranula gibbula
Labidocera acutifrons
Labidocera detruncata
Labidocera euchaeta
Lucicutia flavicornis
Nannocalanus minor
Neocalanus gracilis
Neocalanus robustior
Neocalanus tenuicornis
Oncaea minuta
Paracalanus parvus
Pareuchaeta erebi
Phaënna spinifera

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3901. Off Mokuhooniki, Hawaiian Islands; April 29, 1902; surface; 51 species—Continued

Pleuromamma abdominalis
Pleuromamma gracilis
Pontellina plumata
Pseudocalanus minutus
Sapphirina angusta
Sapphirina auronitens
Sapphirina bicuspidata
Sapphirina metallina
Sapphirina nigromaculata
Scolecithrix danae
Undinula caroli
Undinula vulgaris

3908. Off Diamond Head, south coast of Oahu, Hawaiian Islands; May 5, 1902; surface; 1 species

Pontella atlantica

3911. South of Oahu Island, Hawaiian Islands; May 5, 1902; surface; 1 species

Euchaeta marina

3912. South of Oahu Island, Hawaiian Islands; May 5, 1902; surface; 15 species

Acrocalanus gracilis
Acrocalanus monachus
Copilia quadrata
Euchaeta marina
Farranula rostrata
Nannocalanus minor
Neocalanus gracilis
Oncaea minuta
Paracalanus parvus
Pontella danae
Sapphirina auronitens
Scolecithrix danae
Undinula caroli
Undinula darwinii
Undinula vulgaris

3921. South of Oahu Island, Hawaiian Islands; May 6, 1902; surface; 3 species

Euchaeta marina
Euchaeta pubera
Labidocera acuta

3927. Lat. 21°31′ N., long. 161°55′ W.; Hawaiian Islands; May 11, 1902; surface; 6 species

Candacia simplex
Euchaeta marina
Farranula rostrata
Labidocera acutifrons
Paracalanus parvus
Pontella princeps

3929. Lat. 23°19′ N., long. 166°54′ W.; Hawaiian Islands; May 13, 1902; surface; 4 species

Candacia simplex
Euchaeta marina
Undinula caroli
Undinula vulgaris

3930. Lat. 25°07′ N., long. 170°50′ W.; Hawaiian Islands; May 15, 1902; surface; 8 species

Euchaeta acuta
Euchaeta marina
Oncaea minuta
Phaënna spinifera
Pontella securifer
Scolecithrix danae
Undinula caroli
Undinula vulgaris

3932. Lat. 25°45′ N., long. 171°32′ W.; Hawaiian Islands; May 16, 1902; surface; 23 species

Acartia negligens
Acrocalanus gracilis
Candacia aethiopica
Clytemnestra scutellata
Corycaeus crassiusculus
Corycaeus speciosus
Euchaeta marina
Euchaeta spinosa
Farranula carinata
Labidocera acutifrons
Lucicutia flavicornis
Neocalanus gracilis
Neocalanus tenuicornis
Oncaea venusta
Phaënna spinifera
Pontella securifer
Pontellopsis villosa
Sapphirina auronitens
Sapphirina metallina
Sapphirina stellata
Scolecithricella bradyi
Scolecithrix danae
Undinula vulgaris

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3952. North of Laysan Island, Hawaiian Islands; May 21, 1902; surface; 1 species

Acrocalanus gracilis

3960. Lat. 21°23′ N., long. 158°19′ W.; Hawaiian Islands; June 9, 1902; surface; 22 species

Acrocalanus gracilis
Candacia aethiopica
Corycaeus limbatus
Euchaeta acuta
Euchaeta marina
Labidocera acutifrons
Labidocera detruncata
Macrosetella gracilis
Oithona similis
Oncaea minuta
Oncaea venusta
Phaënna spinifera
Pontella securifer
Pontellina plumata
Pontellopsis brevis
Pontellopsis digitata
Pontellopsis strenua
Scolecithricella bradyi
Scolecithrix danae
Undinula caroli
Undinula darwinii
Undinula vulgaris

3981. Off Kauai Island, Hawaiian Islands; June 10, 1902; surfce; 6 species

Corycaeus pacificus
Farranula rostrata
Labidocera acutifrons
Paracalanus parvus
Pontella atlantica
Pontella securifer

3982. Off Kauai Island, Hawaiian Islands; June 10, 1902; surface; 1 species

Gaetanus minor

4009. Lat. 21°50′30″ N., long. 159°15′ W.; Hawaiian Islands; June 17, 1902; surface; 45 species

Acartia danae
Acrocalanus gibber
Acrocalanus gracilis
Calanopia minor
Calocalanus pavo
Candacia aethiopica
Candacia simplex
Copilia mirabilis
Copilia quadrata
Corycaeus agilis
Corycaeus crassiusculus
Corycaeus flaccus
Corycaeus latus
Corycaeus limbatus
Corycaeus longistylis
Corycaeus lubbockii
Corycaeus speciosus
Corycaeus vitreus
Eucalanus attenuatus
Euchaeta marina
Euchaeta spinosa
Farranula carinata
Farranula concinna
Farranula gibbula
Farranula rostrata
Labidocera acutifrons
Labidocera detruncata
Neocalanus gracilis
Neocalanus robustior
Oncaea minuta
Oncaea venusta
Pareuchaeta incisa
Phaënna spinifera
Pontella securifer
Pontellina plumata
Pontellopsis albatrossi
Pontellopsis armata
Pontellopsis regalis
Sapphirina metallina
Sapphirina nigromaculata
Scolecithricella bradyi
Scolecithrix danae
Undeuchaeta plumosa
Undinula caroli
Undinula vulgaris

4010. Lat. 21°35′ N., long. 158°50′ W.; off Oahu Island, Hawaiian Islands; June 17, 1902; surface; 43 species

Acartia longiremis
Calocalanus styliremis
Candacia aethiopica
Candacia armata
Candacia bipinnata
Candacia norvegica
Candacia simplex
Centropages furcatus
Copilia quadrata
Corycaeus agilis
Corycaeus latus
Corycaeus longistylis
Corycaeus speciosus
Dysgamus pacificus
Eucalanus attenuatus
Eucalanus elongatus
Euchaeta marina
Euchaeta spinosa
Farranula rostrata
Labidocera acuta
Labidocera acutifrons
Labidocera detruncata
Labidocera wollastoni
Lucicutia tenuicauda
Mecynocera clausi
Nannocalanus minor
Neocalanus gracilis
Neocalanus robustior
Oithona similis
Oncaea minuta
Paracalanus parvus
Phaënna spinifera
Pontella atlantica

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4010. Lat. 21°35′ N., long 158°50′ W; off Oahu Island, Hawaiian Islands; June 17, 1902; surface; 43 species—Continued

Pontella securifer
Pontella tenuiremis
Pontellina plumata
Pontellopsis armata
Pseudocalanus minutus
Sapphirina auronitens
Scolecithrix danae
Undeuchaeta plumosa
Undinula caroli
Undinula vulgaris

4011. Lat. 21°20′ N., long. 158°21′ W.; off Oahu Island, Hawaiian Islands; June 18, 1902, surface; 21 species

Acartia danae
Acrocalanus gracilis
Candacia aethiopica
Candacia bipinnata
Candacia norvegica
Eucalanus attenuatus
Euchaeta marina
Farranula rostrata
Labidocera acutifrons
Labidocera detruncata
Lucicutia tenuicauda
Oncaea minuta
Paracalanus parvus
Phaënna spinifera
Pontella fera
Pontella tenuiremis
Scolecithricella auropecten
Scolecithrix danae
Undinula caroli
Undinula darwinii
Undinula vulgaris

4037. Off Hawaii Island, Hawaiian Islands; July 10, 1902; surface; 42 species

Acartia danae
Acrocalanus gibber
Acrocalanus gracilis
Calanopia elliptica
Calanopia minor
Candacia aethiopica
Candacia bispinosa
Candacia simplex
Clytemnestra scutellata
Corycaeus agilis
Corycaeus dubius
Corycaeus flaccus
Corycaeus latus
Corycaeus limbatus
Corycaeus pumilus
Euchaeta marina
Farranula carinata
Farranula concinna
Farranula gibbula
Farranula rostrata
Labidocera acutifrons
Labidocera euchaeta
Labidocera minuta
Macrosetella gracilis
Miracia efferata
Neocalanus gracilis
Neocalanus robustior
Oithona similis
Oncaea minuta
Oncaea venusta
Paracalanus parvus
Phaënna spinifera
Pontella securifer
Pontellina plumata
Pontellopsis strenua
Pseudocalanus minutus
Sapphirina auronitens
Scolecithricella bradyi
Scolecithrix danae
Undinula caroli
Undinula darwinii
Undinula vulgaris

4038. West of Hawaii Island, Hawaiian Islands; July 10, 1902; surface; 1 species

Euchaeta media

4086. North of Maui Island, Hawaiian Islands; July 21, 1902; surface; 3 species

Eucalanus attenuatus
Euchaeta marina
Undinula vulgaris

4190. Lat. 34°39′18″ N., long. 132°04′ W.; Hawaiian Islands; August 27, 1902; surface; 28 species

Acartia longiremis
Candacia aethiopica
Candacia norvegica
Candacia simplex
Corycaeus speciosus
Euchaeta marina
Euchaeta spinosa
Farranula carinata
Farranula rostrata
Labidocera acuta
Labidocera acutifrons
Labidocera detruncata
Mecynocera clausi
Nannocalanus minor
Neocalanus gracilis
Neocalanus tenuicornis
Oncaea minuta
Paracalanus parvus
Pontella atlantica
Pontella princeps
Pontella securifer
Pontellina plumata
Pontellopsis armata
Pseudocalanus minutus
Sapphirina auronitens
Sapphirina metallina
Sapphirina nigromaculata
Sapphirina opalina

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4427. Southeast of Santa Cruz Island, California; April 14, 1904; surface; 5 species

Euaugaptilus gibbus
Euchaeta acuta
Euchaeta marina
Pareuchaeta incisa
Undeuchaeta major

4533. Monterey Bay, California; May 28, 1904; [surface?]; 1 species

Rhincalanus nasutus

4538. Monterey Bay, California; May 31, 1904; [surface?]; 3 species

Pareuchaeta hansenii
Rhincalanus nasutus
Undinula vulgaris

4539. Monterey Bay, California; May 31, 1904; [surface?]; 1 species

Gaussia princeps

4540. Monterey Bay, California; June 1, 1904; [surface?]; 1 species

Candacia curta

4542. Monterey Bay, California; June 1, 1904; [surface?]; 1 species

Gaussia princeps

4561. Monterey Bay, California; June 11, 1904; [surface?]; 1 species

Eucalanus muticus

4571. Lat. 33°40′ N., long. 119°35′ W.; off California; October 7, 1904; 300–0 fathoms; 3 species

Eucalanus muticus
Pontellopsis regalis
Undeuchaeta major

4574. Lat. 30°35′ N., long. 117°23′ W.; Baja California; October 8, 1904; 300–0 fathoms; 19 species

Aetideus armatus
Calanus helgolandicus
Chirundina streetsi
Clausocalanus arcuicornis
Clausocalanus furcatus
Eucalanus elongatus
Eucalanus muticus
Gaidius pungens
Heterorhabdus robustus
Heterorhabdus spinifrons
Lophothrix frontalis
Lucicutia atlantica
Pleuromamma abdominalis
Pleuromamma gracilis
Pleuromamma robusta
Pontella atlantica
Rhincalanus nasutus
Scolecithrix danae
Undeuchaeta major

4580. Lat. 24°55′ N., long. 112°45′ W.; Baja California; October 10, 1904; 300–0 fathoms; 10 species

Eucalanus attenuatus
Eucalanus elongatus
Eucalanus muticus
Euchaeta acuta
Euchaeta marina
Heterostylites longicornis
Labidocera acutifrons
Pleuromamma abdominalis
Rhincalanus nasutus
Scolecithrix danae

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4583. Lat. 22°45′ N., long. 110°05′ W.; Baja California; October 11, 1904; 300–0 fathoms; 11 species

Eucalanus attenuatus
Eucalanus muticus
Euchaeta acuta
Euchaeta marina
Euchaeta spinosa
Haloptilus longicornis
Heterostylites longicornis
Labidocera acuta
Metridia curticauda
Pareuchaeta grandiremis
Pleuromamma robusta

4585. Lat. 21°00′ N., long. 107°37′ W.; Baja California; October 12, 1904; 2 fathoms; 8 species

Eucalanus attenuatus
Eucalanus muticus
Euchaeta acuta
Labidocera acuta
Metridia curticauda
Pareuchaeta grandiremis
Pleuromamma robusta
Rhincalanus nasutus

4587. Lat. 20°00′ N., long. 106°12′ W.; west coast of Mexico; October 12, 1904; 2 fathoms; 4 species

Euchaeta acuta
Euchirella venusta
Haloptilus longicornis
Pleuromamma robusta

***4588. Lat. 19°52′ N., long. 106°02′ W.; southwest coast of Mexico; October 12, 1904; surface; 26 species**

Acrocalanus longicornis
Centropages krøyeri
Centropages violaceus
Copilia mirabilis
Corycaeus clausi
Corycaeus latus
Eucalanus attenuatus
Euchaeta marina
Euchaeta spinosa
Farranula rostrata
Labidocera acuta
Labidocera krøyeri
Microsetella rosea
Nannocalanus minor
Neocalanus gracilis
Oncaea minuta
Paracalanus parvus
Pareuchaeta californica
Pontella atlantica
Pontellina plumata
Pontellopsis regalis
Sapphirina nigromaculata
Scolecithrix danae
Temora stylifera
Undinula darwinii
Undinula vulgaris

***4589. Lat. 18°50′ N., long. 104°50′ W.; southwest coast of Mexico; October 13, 1904; 300–0 fathoms; 1 species**

Haloptilus longicornis

***4590. Lat. 18°50′ N., long. 104°50′ W.; southwest coast of Mexico; October 13, 1904; 2 fathoms; 6 species**

Eucalanus attenuatus
Eucalanus muticus
Euchaeta marina
Labidocera acutifrons
Pleuromamma abdominalis
Scaphocalanus robustus

***4592. Lat. 18°17′30″ N., long. 103°35′ W.; southwest coast of Mexico; October 13, 1904; surface; 7 species**

Eucalanus attenuatus
Euchaeta marina
Euchaeta wolfendeni
Labidocera acuta
Pontella danae
Pontellopsis regalis
Undinula vulgaris

***4594. Lat. 17°17′ N., long. 101°35′ W.; southwest coast of Mexico; October 14, 1904; 300–0 fathoms; 5 species**

Eucalanus monachus
Eucalanus muticus
Euchaeta marina
Euchirella venusta
Pleuromamma robusta

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***4598. Lat. 15°58′ N., long. 98°13′ W.; southwest coast of Mexico; October 15, 1904; 300–0 fathoms; 6 species**

Candacia pachydactyla	Eucalanus muticus	Pleuromamma robusta
Eucalanus mucronatus	Euchirella venusta	Undinula vulgaris

***4600. Lat. 15°36′ N., long. 96°59′ W.; Central America, west coast; October 15, 1904; surface; 2 species**

Labidocera acuta	Undinula vulgaris

***4605. Lat. 12°20′ N., long. 92°13′ W.; Central America, west coast; October 17, 1904; 300–0 fathoms; 10 species**

Arietellus giesbrechti	Eucalanus muticus	Labidocera acuta
Candacia simplex	Euchaeta marina	Rhincalanus cornutus
Eucalanus attenuatus	Euchirella venusta	
Eucalanus mucronatus	Haloptilus ornatus	

***4607. Lat. 12°00′ N., long. 91°30′ W.; Central America, west coast; October 17, 1904; surface; 7 species**

Candacia simplex	Eucalanus muticus	Pontella chierchiae
Euaugaptilus squamatus	Euchaeta marina	Undinula vulgaris
Eucalanus attenuatus		

4609. Lat. 11°03′ N., 89°35′ W.; Central America, west coast; October 18, 1904; 300–0 fathoms; 2 species

Phyllopus bidentatus	Sapphirina nigromaculata

4611. Lat. 10°32′ N., long. 88°25′ W.; Central America, west coast; October 18, 1904; surface, electric-light; 27 species

Candacia aethiopica	Eucalanus subtenuis	Pontella atlantica
Candacia armata	Euchaeta acuta	Pontella danae
Candacia bispinosa	Euchaeta marina	Sapphirina nigromaculata
Candacia longimana	Euchirella galeata	Sapphirina opalina
Candacia norvegica	Labidocera detruncata	Scolecithricella bradyi
Candacia simplex	Labidocera krøyeri	Scolecithrix danae
Copilia denticulata	Nannocalanus minor	Temora discaudata
Eucalanus attenuatus	Oncaea venusta	Temora stylifera
Eucalanus monachus	Pleuromamma xiphias	Undinula vulgaris

***4613. Lat. 9°43′ N., long. 86°15′ W.; Central America, west coast; October 19, 1904; 300–0 fathoms; 7 species**

Eucalanus attenuatus	Euchaeta marina	Rhincalanus nasutus
Eucalanus elongatus	Rhincalanus cornutus	Undinula darwinii
Eucalanus muticus		

4614. Lat. 9°06′ N., long. 85°08′ W.; Central America, west coast; October 19, 1904; 2 fathoms; 1 species

Undinula caroli

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***4615. Lat. 9°06′ N., long. 85°08′ W.; Central America, west coast; October 19, 1904; surface; 16 species**

Aetideus armatus
Candacia armata
Candacia bipinnata
Eucalanus attenuatus
Eucalanus monachus
Euchaeta marina
Labidocera acuta
Labidocera acutifrons
Labidocera detruncata
Pachos punctatum
Pontella atlantica
Pontella danae
Pontella lobiancoi
Pontellina plumata
Pontellopsis regalis
Undinula vulgaris

***4617. Lat. 7°21′ N., long. 82°21′ W.; south coast of Panama; October 20, 1904; surface; 2 species**

Labidocera detruncata
Pontella atlantica

4618. Lat. 7°17′ N., long. 82°11′ W.; south coast of Panama; October 20, 1904; 2 fathoms; 1 species

Pontellopsis regalis

***4619. Lat. 7°17′ N., long. 82°11′ W.; south coast of Panama; October 20, 1904; surface; 11 species**

Euchaeta marina
Labidocera acuta
Labidocera acutifrons
Labidocera detruncata
Pleuromamma abdominalis
Pleuromamma xiphias
Pontella danae
Pontellopsis regalis
Pontellopsis strenua
Sapphirina iris
Undinula vulgaris

4627. Lat. 7°21′ N., long. 79°56′ W.; south of Panama; November 2, 1904; surface; 2 species

Pleuromamma robusta
Undinula vulgaris

4630. Lat. 6°55′ N., long. 81°42′30″ W.; Panama to Galápagos Islands; November 3, 1904; bottom; 1 species

Rhincalanus cornutus

4632. Lat. 5°48′ N., long. 82°16′ W.; Panama to Galápagos Islands; November 3, 1904; 2 fathoms; 1 species

Rhincalanus nasutus

***4634. Lat. 4°35′30″ N., long. 83°32′30″ W.; west of Colombia; November 4, 1904; 300–0 fathoms; 14 species**

Eucalanus attenuatus
Eucalanus elongatus
Eucalanus muticus
Euchaeta longicornis
Haloptilus acutifrons
Haloptilus ornatus
Heterorhabdus papilliger
Heterorhabdus robustus
Lucicutia curta
Lucicutia flavicornis
Pareuchaeta grandiremis
Pareuchaeta rasa
Phaënna spinifera
Scaphocalanus affinis

***4635. Lat. 3°52′30″ N., long. 84°15′ W.; west of Colombia; November 4, 1904; surface; 16 species**

Candacia curta
Candacia simplex
Canthocalanus pauper
Centropages furcatus
Eucalanus attenuatus
Eucalanus elongatus
Euchaeta longicornis
Euchaeta marina
Labidocera detruncata
Nannocalanus minor
Neocalanus gracilis
Pleuromamma abdominalis
Pontella danae
Scolecithrix danae
Undinula darwinii
Undinula vulgaris

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***4637. Lat. 1°31′ N., long. 86°32′ W.; off Galápagos Islands; November 5, 1904; 300–0 fathoms; 11 species**

Corycaeus limbatus
Euchirella galeata
Gaetanus kruppii
Haloptilus ornatus
Lucicutia flavicornis
Metridia princeps
Metridia venusta
Pareuchaeta grandiremis
Pleuromamma xiphias
Rhincalanus nasutus
Scolecithricella vittata

***4638. Lat. 00°27′ N., long. 87°13′ W.; west of Ecuador; November 6, 1904; 300–0 fathoms; 34 species**

Arietellus setosus
Augaptilus longicaudatus
Candacia longimana
Candacia norvegica
Eucalanus attenuatus
Eucalanus pileatus
Eucalanus subcrassus
Euchaeta longicornis
Euchaeta marina
Euchirella bella
Euchirella galeata
Euchirella messinensis
Euchirella venusta
Gaetanus miles
Gaidius brevispinus
Haloptilus longicornis
Haloptilus ornatus
Heterostylites longicornis
Labidocera acuta
Lucicutia atlantica
Lucicutia flavicornis
Metridia princeps
Metridia venusta
Pareuchaeta grandiremis
Phaënna spinifera
Pleuromamma abdominalis
Pontellina plumata
Rhincalanus cornutus
Rhincalanus nasutus
Scolecithrix danae
Scottocalanus securifrons
Temora discaudata
Undinula darwinii
Undinula vulgaris

***4640. Lat. 00°40′ S., long. 88°11′ W.; west of Ecuador; November 6, 1904; 2 fathoms; 21 species**

Candacia armata
Candacia pachydactyla
Centropages furcatus
Eucalanus attenuatus
Eucalanus elongatus
Eucalanus subcrassus
Euchaeta longicornis
Euchaeta marina
Labidocera acuta
Labidocera acutifrons
Nannocalanus minor
Pleuromamma abdominalis
Pleuromamma gracilis
Pontella atlantica
Pontella danae
Pontellopsis regalis
Pontellopsis strenua
Scolecithrix danae
Temora discaudata
Temora stylifera
Undinula vulgaris

4642. Lat. 1°30′30″ S.; long. 89°35′ W.; Galápagos Islands; November 7, 1904; bottom; 2 species

Gaetanus kruppii
Pontella tenuiremis

***4644. Lat. 2°13′ S., long. 89°42′ W.; off Galápagos Islands; November 7, 1904; surface; 33 species**

Acrocalanus gibber
Calocalanus pavo
Candacia bispinosa
Candacia simplex
Centropages furcatus
Centropages violaceus
Corycaeus flaccus
Eucalanus attenuatus
Eucalanus elongatus
Eucalanus monachus
Eucalanus subcrassus
Euchaeta acuta
Euchaeta longicornis
Euchaeta marina
Gaetanus armiger
Labidocera acuta
Labidocera acutifrons
Labidocera detruncata
Lucicutia lucida
Microsetella rosea
Nannocalanus minor
Neocalanus gracilis
Oncaea venusta
Pleuromamma abdominalis
Pleuromamma gracilis
Pleuromamma piseki
Pontellina plumata
Sapphirina nigromaculata
Scolecithrix danae
Temora discaudata
Temora stylifera
Undinula darwinii
Undinula vulgaris

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***4646. Lat. 4°02′ S., long. 89°16′ W.; south of Galápagos Islands; November 8, 1904; 300–0 fathoms; 29 species**

Candacia bispinosa
Candacia longimana
Candacia norvegica
Chiridius armatus
Euaugaptilus laticeps
Euaugaptilus oblongus
Eucalanus attenuatus
Eucalanus muticus
Eucalanus subtenuis
Euchaeta acuta
Euchaeta longicornis
Euchaeta marina
Euchaeta spinosa
Gaetanus recticornis
Heterorhabdus spinifrons
Heterostylites longicornis
Metridia curticauda
Nannocalanus minor
Pareuchaeta barbata
Pareuchaeta grandiremis
Phaënna spinifera
Pleuromamma gracilis
Pontellina plumata
Rhincalanus cornutus
Rhincalanus nasutus
Scaphocalanus magnus
Scolecithrix danae
Temora discaudata
Undinula vulgaris

***4648. Lat. 4°43′ S., long. 87°07′30″ W.; south of Galápagos Islands; November 9, 1904; 300–0 fathoms; 13 species**

Copilia quadrata
Eucalanus attenuatus
Eucalanus elongatus
Gaetanus miles
Haloptilus longicornis
Lucicutia grandis
Metridia curticauda
Pareuchaeta barbata
Pareuchaeta grandiremis
Pontellina plumata
Pontellopsis regalis
Scolecithrix danae
Undinula darwinii

4649. Lat. 5°17′ S., long. 85°20′ W.; south of Galápagos Islands; November 10, 1904; surface; 1 species

Pontellopsis regalis

***4650. Lat. 5°21′ S., long. 84°39′ W.; off Peru; November 10, 1904; 300–0 fathoms; 10 species**

Eucalanus attenuatus
Eucalanus muticus
Eucalanus subtenuis
Euchirella galeata
Gaetanus kruppii
Lucicutia grandis
Pareuchaeta barbata
Pontella danae
Rhincalanus cornutus
Rhincalanus nasutus

***4652. Lat. 5°45′ S., long. 82°40′ W.; off Peru; November 11, 1904; 400–0 fathoms; 30 species**

Aetideus armatus
Calanus helgolandicus
Centropages furcatus
Disseta palumboi
Euaugaptilus laticeps
Euaugaptilus palumboi
Euaugaptilus squamatus
Eucalanus muticus
Eucalanus subcrassus
Eucalanus subtenuis
Euchaeta acuta
Euchaeta longicornis
Euchirella galeata
Euchirella messinensis
Heterorhabdus papilliger
Heterostylites longicornis
Labidocera acutifrons
Lucicutia grandis
Megacalanus longicornis
Metridia curticauda
Pareuchaeta grandiremis
Pareuchaeta rasa
Phaënna spinifera
Pleuromamma abdominalis
Pleuromamma gracilis
Pleuromamma robusta
Pontellopsis regalis
Rhincalanus nasutus
Scolecithricella abyssalis
Scolecithricella auropecten

4653. Lat. 5°47′ S., long. 81°24′ W.; off Peru; November 12, 1904; 3 species

Neocalanus gracilis
Sapphirina sali
Undinula vulgaris

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***4655. Lat. 5°57′30″ S., long. 81°50′ W.; off Peru; November 12, 1904; 400–0 fathoms; 20 species**

Arietellus simplex
Calanus finmarchicus
Calanus helgolandicus
Candacia pachydactyla
Euaugaptilus nodifrons
Euaugaptilus oblongus
Eucalanus muticus
Euchirella venusta
Gaetanus recticornis
Haloptilus ornatus
Heterorhabdus spinifrons
Lucicutia grandis
Megacalanus longicornis
Nannocalanus minor
Pareuchaeta scotti
Pleuromamma abdominalis
Rhincalanus nasutus
Sapphirina metallina
Sapphirina opalina
Scaphocalanus magnus

***4657. Lat. 7°12′30″ S., long. 84°09′ W.; off Peru; November 13, 1904; 300–0 fathoms; 8 species**

Calanus helgolandicus
Euaugaptilus laticeps
Eucalanus muticus
Eucalanus subtenuis
Euchaeta marina
Euchirella venusta
Lucicutia flavicornis
Pleuromamma abdominalis

4658. Lat. 8°30′ S., long. 85°36′ W.; off Peru; November 14, 1904; 300–0 fathoms; 1 species

Euchirella venusta

***4659. Lat. 8°55′ S., long. 86°05′ W.; off Peru; November 14, 1904; 300–0 fathoms; 18 species**

Candacia simplex
Centropages violaceus
Copilia quadrata
Euaugaptilus squamatus
Eucalanus monachus
Eucalanus muticus
Eucalanus subtenuis
Euchaeta acuta
Euchaeta marina
Euchirella venusta
Haloptilus ornatus
Heterostylites longicornis
Labidocera acutifrons
Nannocalanus minor
Pareuchaeta grandiremis
Pontella danae
Scolecithricella bradyi
Scolecithrix danae

4660. Lat. 9°55′ S., long. 87°30′ W; off Peru; November 15, 1904; caught in open net hauled up from bottom; 1 species

Pareuchaeta barbata

***4661. Lat. 10°17′ S., long. 88°02′ W.; off Peru; November 15, 1904; surface; electric light; 14 species**

Centraugaptilus cucullatus
Centraugaptilus horridus
Centraugaptilus rattrayi
Disseta palumboi
Euaugaptilus nodifrons
Eucalanus monachus
Euchaeta marina
Euchirella galeata
Euchirella venusta
Labidocera acutifrons
Lucicutia grandis
Megacalanus longicornis
Pareuchaeta barbata
Scaphocalanus affinis

***4663. Lat. 11°20′ S., long. 88°55′ W.; off Peru; November 16, 1904; 300–0 fathoms; 37 species**

Copilia quadrata
Disseta palumboi
Ectinosoma curticornis
Euaugaptilus laticeps
Euaugaptilus oblongus
Eucalanus attenuatus
Eucalanus elongatus
Eucalanus muticus
Eucalanus subtenuis
Euchaeta longicornis
Euchirella galeata
Euchirella venusta
Gaetanus armiger
Gaetanus kruppii
Gaetanus latifrons
Haloptilus longicornis
Haloptilus ornatus
Hemirhabdus grimaldii
Heterostylites longicornis
Labidocera acutifrons
Lucicutia grandis
Megacalanus longicornis
Metridia princeps
Microsetella rosea

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***4663. Lat. 11°20′ S., long. 88°55′ W.; off Peru; November 16, 1904; 300–0 fathoms; 37 species—Continued**

Nannocalanus minor
Oncaea minuta
Pareuchaeta barbata
Pareuchaeta grandiremis
Phyllopus bidentatus
Sapphirina nigromaculata
Sapphirina opalina
Sapphirina scarlata
Scaphocalanus magnus
Scolecithrix danae
Spinocalanus abyssalis
Temora discaudata
Vettoria granulosa

***4664. Lat. 11°30′ S., long. 87°19′ W.; off Peru; November 17, 1904; 300–0 fathoms; 34 species**

Acartia negligens
Amallothrix obtusifrons
Candacia pachydactyla
Centraugaptilus rattrayi
Clausocalanus arcuicornis
Euaugaptilus laticeps
Euaugaptilus nodifrons
Eucalanus muticus
Eucalanus subtenuis
Euchaeta longicornis
Euchirella galeata
Euchirella pulchra
Gaetanus inermis
Gaetanus kruppii
Gaetanus microcanthus
Gaetanus recticornis
Haloptilus longicornis
Haloptilus ornatus
Labidocera acutifrons
Lophothrix frontalis
Lucicutia flavicornis
Lucicutia grandis
Megacalanus longicornis
Metridia brevicauda
Metridia curticauda
Nannocalanus minor
Pachyptilus abbreviatus
Paracalanus parvus
Pareuchaeta barbata
Pareuchaeta grandiremis
Phyllopus bidentatus
Phyllopus impar
Rhincalanus cornutus
Temora discaudata

***4665. Lat. 11°45′ S., long. 86°05′ W.; off Peru; November 17, 1904; surface, electric light; 30 species**

Aetideus armatus
Amallothrix arcuata
Amallothrix gracilis
Amallothrix obtusifrons
Centraugaptilus rattrayi
Centropages calaninus
Disseta palumboi
Euaugaptilus nodifrons
Eucalanus attenuatus
Eucalanus subtenuis
Euchirella bella
Euchirella galeata
Euchirella venusta
Gaetanus kruppii
Gaetanus pileatus
Gaetanus recticornis
Haloptilus ornatus
Lophothrix frontalis
Lucicutia grandis
Megacalanus longicornis
Metridia princeps
Onchocalanus trigoniceps
Pachyptilus abbreviatus
Pareuchaeta barbata
Pareuchaeta grandiremis
Phaënna spinifera
Phyllopus bidentatus
Scaphocalanus affinis
Scaphocalanus magnus
Xanthocalanus greeni

***4667. Lat. 12°00′ S., long. 83°40′ W.; off Peru; November 18, 1904; surface, electric light; 38 species**

Amallothrix arcuata
Candacia simplex
Centraugaptilus horridus
Centraugaptilus rattrayi
Disseta palumboi
Euaugaptilus nodifrons
Euaugaptilus squamatus
Eucalanus attenuatus
Eucalanus elongatus
Eucalanus mucronatus
Eucalanus muticus
Eucalanus subtenuis
Euchaeta marina
Euchirella bella
Euchirella galeata
Gaetanus kruppii
Gaetanus microcanthus
Gaidius affinis
Haloptilus longicornis
Haloptilus ornatus
Heterostylites longicornis
Labidocera acutifrons
Labidocera lubbockii
Lophothrix frontalis
Lucicutia grandis
Megacalanus longicornis
Metridia curticauda
Metridia princeps
Onchocalanus hirtipes
Pachyptilus abbreviatus
Pareuchaeta barbata
Pareuchaeta grandiremis
Pareuchaeta tumidula
Pontella atlantica
Pontellopsis regalis
Pseudocalanus minutus
Scaphocalanus affinis
Scottocalanus persecans

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***4668. Lat. 12°09′ S., long. 81°45′ W.; off Peru; November 19, 1904; 300–0 fathoms; 8 species**

Amallothrix obtusifrons
Centraugaptilus cucullatus
Euaugaptilus nodifrons
Euaugaptilus oblongus
Eucalanus muticus
Euchirella galeata
Gaidius affinis
Metridia princeps

***4669. Lat. 12°13′ S., long. 80°25′ W.; off Peru; November 19, 1904; surface; 11 species**

Augaptilus longicaudatus
Centraugaptilus cucullatus
Disseta palumboi
Euaugaptilus nodifrons
Gaetanus kruppii
Gaetanus microcanthus
Gaidius affinis
Labidocera acutifrons
Megacalanus longicornis
Pareuchaeta barbata
Pontella tenuiremis

4671. Lat. 12°07′ S., long. 78°28′ W.; off Peru; November 20, 1904; surface; 31 species

Augaptilus longicaudatus
Candacia curta
Candacia pachydactyla
Chirundina streetsi
Euaugaptilus angustus
Euaugaptilus laticeps
Euaugaptilus magnus
Euaugaptilus oblongus
Euaugaptilus squamatus
Eucalanus attenuatus
Eucalanus elongatus
Eucalanus muticus
Eucalanus subtenuis
Euchaeta longicornis
Euchaeta marina
Euchirella galeata
Euchirella venusta
Haloptilus ornatus
Heteroptilus acutilobus
Heterorhabdus spinifrons
Labidocera acutifrons
Megacalanus longicornis
Metridia curticauda
Oncaea venusta
Pachyptilus abbreviatus
Pachyptilus eurygnathus
Pareuchaeta barbata
Pareuchaeta sarsi
Sapphirina opalina
Scaphocalanus affinis
Undinula darwinii

4672. Lat. 13°11′30″ S., long. 78°18′ W.; off Peru; November 21, 1904; 300–0 fathoms; 1 species

Megacalanus longicornis

***4673. Lat. 12°30′30″ S., long. 77°49′30″ W.; off Peru; November 21, 1904; surface, electric light; 31 species**

Acartia danae
Aetideus armatus
Amallophora typica
Arietellus plumifer
Arietellus simplex
Calanus finmarchicus
Calanus helgolandicus
Candacia curta
Centropages brachiatus
Centropages typicus
Clausocalanus arcuicornis
Disseta palumboi
Euaugaptilus oblongus
Euaugaptilus palumboi
Eucalanus attenuatus
Eucalanus crassus
Eucalanus monachus
Eucalanus muticus
Eucalanus subcrassus
Eucalanus subtenuis
Euchaeta marina
Euchirella pulchra
Heterostylites longicornis
Labidocera acutifrons
Megacalanus longicornis
Metridia boeckii
Metridia curticauda
Nannocalanus minor
Paracalanus parvus
Pareuchaeta grandiremis
Scolecithricella bradyi

4674. Lat. 12°14′30″ S., long. 78°43′30″ W.; off Peru; November 22, 1904; depth not given; 2 species

Neocalanus robustior
Scolecithrix danae

4675. Lat. 12°54′ S., long. 78°33′ W.; off Peru; November 22, 1904; surface; 1 species

Megacalanus longicornis

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***4676. Lat. 14°29′ S., long. 80°24′ W.; off Peru; December 5, 1904; surface; 19 species**

Disseta palumboi
Euaugaptilus laticeps
Euaugaptilus magnus
Euaugaptilus nodifrons
Eucalanus attenuatus
Eucalanus elongatus
Eucalanus muticus
Euchirella galeata
Euchirella venusta
Gaetanus recticornis
Lucicutia grandis
Megacalanus longicornis
Mormonilla phasma
Oithona robusta
Onchocalanus trigoniceps
Pachyptilus abbreviatus
Pareuchaeta barbata
Pareuchaeta grandiremis
Phyllopus bidentatus

4678. Lat. 16°31′ S., long. 85°04′ W.; off Peru; December 6, 1904; surface; 3 species

Gaetanus minor
Haloptilus longicornis
Neocalanus robustior

***4679. Lat. 17°26′ S., long. 86°46′ W.; Peru to Easter Island; December 7, 1904; 300–0 fathoms; 48 species**

Amallothrix arcuata
Amallothrix curticauda
Amallothrix invenusta
Amallothrix obtusifrons
Arietellus simplex
Bathypontia elongata
Caligus coryphaenae
Candacia pachydactyla
Candacia simplex
Disseta palumboi
Euaugaptilus laticeps
Euaugaptilus magnus
Euaugaptilus nodifrons
Euaugaptilus oblongus
Euaugaptilus squamatus
Eucalanus elongatus
Euchirella galeata
Euchirella messinensis
Euchirella venusta
Gaetanus kruppii
Gaetanus microcanthus
Gaetanus miles
Gaetanus pileatus
Gaetanus recticornis
Gaussia princeps
Haloptilus chierchiae
Haloptilus fons
Haloptilus ornatus
Lucicutia flavicornis
Lucicutia grandis
Megacalanus longicornis
Metridia princeps
Mormonilla phasma
Neocalanus robustior
Onchocalanus affinis
Onchocalanus trigoniceps
Pachyptilus abbreviatus
Pachyptilus eurygnathus
Pareuchaeta barbata
Pareuchaeta grandiremis
Pareuchaeta sarsi
Pareuchaeta tumidula
Phyllopus bidentatus
Pseudeuchaeta brevicauda
Pseudochirella obtusa
Scaphocalanus affinis
Scaphocalanus medius
Undeuchaeta major

4680. Lat. 17°55′ S., long. 87°42′ W.; Peru to Easter Island; December 7, 1904; surface; 2 species

Euchirella bitumida
Pontella atlantica

***4681. Lat. 18°47′ S., long. 89°26′ W.; Peru to Easter Island; December 8, 1904; 300–0 fathoms; 37 species**

Bathypontia elongata
Centraugaptilus rattrayi
Cephalophanes refulgens
Chirundina streetsi
Disseta scopularis
Euaugaptilus longimanus
Euaugaptilus squamatus
Eucalanus elongatus
Euchaeta marina
Euchirella grandicornis
Euchirella pulchra
Gaetanus kruppii
Gaetanus microcanthus
Gaetanus miles
Gaetanus recticornis
Haloptilus longicornis
Haloptilus ornatus
Lophothrix frontalis
Lucicutia flavicornis
Mecynocera clausi
Megacalanus longicornis
Metridia princeps
Neocalanus robustior
Pachos punctatum
Pachyptilus abbreviatus
Pareuchaeta barbata
Pareuchaeta grandiremis
Pareuchaeta incisa
Pleuromamma abdominalis
Pleuromamma robusta
Pleuromamma xiphias
Rhincalanus cornutus
Scaphocalanus magnus
Scottocalanus securifrons
Undeuchaeta major
Undeuchaeta plumosa
Undinula darwinii

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***4683. Lat. 20°02′30″ S., long. 91°52′30″ W.; Peru to Easter Island; December 9, 1904; 300–0 fathoms; 17 species**

Centropages violaceus
Cephalophanes refulgens
Corycaeus longistylis
Euaugaptilus oblongus
Eucalanus elongatus
Euchaeta pubera
Euchirella curticauda
Gaetanus latifrons
Gaetanus pileatus
Megacalanus longicornis
Metridia princeps
Neocalanus robustior
Pareuchaeta tonsa
Phyllopus bidentatus
Pontella tenuiremis
Pontellopsis muticus
Undeuchaeta plumosa

***4684. Lat. 20°40′ S., long. 93°19′ W.; Peru to Easter Island; December 9, 1904; surface; 9 species**

Candacia aethiopica
Centropages violaceus
Euchaeta concinna
Euchaeta marina
Megacalanus princeps
Nannocalanus minor
Neocalanus gracilis
Pontellopsis strenua
Scolecithrix danae

***4685. Lat. 21°36′ S., long. 94°56′ W.; Peru to Easter Island; December 10, 1904; 300–0 fathoms; 27 species**

Augaptilus anceps
Candacia longimana
Centropages violaceus
Chirundina streetsi
Clytemnestra scutellata
Euaugaptilus oblongus
Eucalanus elongatus
Euchaeta acuta
Euchaeta pubera
Euchirella brevis
Euchirella curticauda
Gaetanus latifrons
Gaetanus pileatus
Haloptilus longicornis
Heterorhabdus spinifrons
Metridia longa
Metridia princeps
Neocalanus robustior
Pachyptilus abbreviatus
Pareuchaeta tonsa
Phyllopus bidentatus
Pleuromamma gracilis
Pleuromamma xiphias
Pontella danae
Pontella tenuiremis
Scottocalanus securifrons
Undeuchaeta plumosa

***4687. Lat. 22°50′ S., long. 97°30′ W.; Peru to Easter Island; December 11, 1904; 2,000–0 fathoms; 42 species**

Amallothrix curticauda
Augaptilus longicaudatus
Bathypontia elongata
Centraugaptilus rattrayi
Chirundina streetsi
Disseta palumboi
Euaetideus giesbrechti
Euaugaptilus bullifer
Euaugaptilus laticeps
Euaugaptilus longimanus
Euaugaptilus palumboi
Eugaugaptilus rigidus
Euaugaptilus squamatus
Eucalanus elongatus
Euchaeta marina
Euchirella curticauda
Gaetanus kruppii
Gaetanus miles
Gaetanus minor
Gaetanus pileatus
Gaussia princeps
Haloptilus longicornis
Heteroptilus attenuatus
Heterorhabdus norvegicus
Lopthothrix frontalis
Lophothrix sarsi
Lucicutia atlantica
Lucicutia grandis
Megacalanus princeps
Metridia princeps
Neocalanus robustior
Pareuchaeta grandiremis
Pareuchaeta tonsa
Phyllopus bidentatus
Phyllopus muticus
Pleuromamma xiphias
Pseudeuchaeta brevicauda
Pseudochirella obtusa
Pseudochirella scopularis
Scolecithrix danae
Undeuchaeta major
Undeuchaeta plumosa

4688. Lat. 23°17′ S., long. 98°37′30″ W.; Peru to Easter Island; December 11, 1904; surface; 4 species

Candacia aethiopica
Centropages violaceus
Neocalanus gracilis
Pachyptilus abbreviatus

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***4689. Lat. 24°05′ S., long. 100°20′ W.; Peru to Easter Island; December 12, 1904; 300–0 fathoms; 9 species**

Arietellus armatus
Euchirella venusta
Gaetanus miles
Haloptilus longicornis
Neocalanus gracilis
Neocalanus robustior
Pleuromamma abdominalis
Pleuromamma xiphias
Pontellopsis strenua

***4691. Lat. 25°27′ S., long. 103°29′ W.; Peru to Easter Island; December 13, 1904; 300–0 fathoms; 11 species**

Candacia curta
Candacia longimana
Candacia simplex
Euaugaptilus angustus
Eucalanus elongatus
Euchaeta acuta
Gaidius pungens
Haloptilus longicornis
Pleuromamma xiphias
Undeuchaeta major
Undeuchaeta plumosa

4692. Lat. 25°40′30″ S., long. 104°01′ W.; Peru to Easter Island; December 13, 1904; surface; 4 species

Candacia aethiopica
Neocalanus robustior
Pontella atlantica
Pontella lobiancoi

4693. Lat. 26°30′ S., long. 105°45′ W.; Peru to Easter Island; December 14, 1904; surface; 2 species

Euchirella curticauda
Euchirella venusta

4694. Lat. 26°34′ S., long. 108°57′30″ W.; north of Easter Island; December 22, 1904; surface; 2 species

Euchaeta spinosa
Neocalanus gracilis

***4695. Lat. 25°22′30″ S., long. 107°45′ W.; north of Easter Island; December 23, 1904; 300–0 fathoms; 9 species**

Augaptilus longicaudatus
Euaugaptilus angustus
Euaugaptilus hecticus
Euaugaptilus laticeps
Euchirella messinensis
Gaetanus miles
Phyllopus bidentatus
Pleuromamma xiphias
Pontellopsis strenua

***4696. Lat. 24°40′ S., long. 107°05′ W., between Easter Island and the Galápagos; December 23, 1904; surface; 1 species**

Pontella tenuiremis

***4699. Lat. 21°40′ S., long. 104°30′ W.; Easter to Galápagos Islands; December 25, 1904; 300–0 fathoms; 6 species**

Candacia curta
Candacia simplex
Euchirella brevis
Euchirella pulchra
Gaetanus miles
Sapphirina metallina

***4700. Lat. 20°29′ S., long. 103°26′ W.; Easter to Galápagos Islands; December 25, 1904; 300–0 fathoms; 70 species**

Acartia longiremis
Aegisthus mucronatus
Aetideus armatus
Amallophora typica
Arietellus plumifer
Arietellus simplex
Augaptilus longicaudatus
Augaptilus megalurus
Candacia bipinnata
Candacia bispinosa
Candacia longimana
Candacia simplex
Centraugaptilus rattrayi
Centropages violaceus
Copilia mirabilis

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***4700. Lat. 20°29′ S., long. 103°26′ W.; Easter to Galápagos Islands; December 25, 1904; 300–0 fathoms; 70 species—Continued**

Euaugaptilus oblongus
Euaugaptilus squamatus
Eucalanus elongatus
Eucalanus muticus
Euchaeta concinna
Euchaeta marina
Euchaeta spinosa
Euchirella bella
Euchirella brevis
Euchirella galeata
Euchirella messinensis
Euchirella pulchra
Gaetanus curvispinus
Gaetanus miles
Gaetanus pileatus
Gaidius brevicaudatus
Haloptilus longicornis
Haloptilus ornatus
Haloptilus validus
Heteroptilus attenuatus
Heterorhabdus papilliger
Heterostylites longicornis
Labidocera detruncata
Labidocera wollastoni
Lophothrix frontalis
Lucicutia flavicornis
Mecynocera clausi
Megacalanus longicornis
Metridia curticauda
Metridia princeps
Mormonilla minor
Nannocalanus minor
Neocalanus gracilis
Oculosetella gracilis
Oithona plumifera
Pachyptilus abbreviatus
Pareuchaeta barbata
Pareuchaeta californica
Pareuchaeta erebi
Pareuchaeta grandiremis
Pleuromamma abdominalis
Pleuromamma gracilis
Pleuromamma robusta
Pleuromamma xiphias
Pontella tenuiremis
Rhincalanus cornutus
Rhincalanus nasutus
Sapphirina nigromaculata
Sapphirina stellata
Scolecithricella bradyi
Scolecithricella dentata
Scolecithricella vittata
Scolecithrix danae
Undinula darwinii
Undinula vulgaris

***4701. Lat. 19°11′30″ S., long. 102°24′ W.; Easter to Galápagos Islands; December 26, 1904; 300–0 fathoms; 12 species**

Gaetanus minor
Haloptilus spiniceps
Heterorhabdus norvegicus
Heterorhabdus spinifrons
Lucicutia longicornis
Mecynocera clausi
Metridia princeps
Metridia venusta
Neocalanus robustior
Pareuchaeta exigua
Pareuchaeta grandiremis
Pareuchaeta sarsi

***4703. Lat. 17°19′ S., long. 100°52′30″ W.; Easter to Galápagos Islands; December 27, 1904; 300–0 fathoms; 13 species**

Augaptilus longicaudatus
Gaetanus curvispinus
Haloptilus ornatus
Lophothrix frontalis
Lucicutia flavicornis
Metridia princeps
Nannocalanus minor
Neocalanus robustior
Pareuchaeta tonsa
Phyllopus bidentatus
Pleuromamma xiphias
Rhincalanus cornutus
Scottocalanus securifrons

***4705. Lat. 15°05′ S., long. 99°19′ W.; Easter to Galápagos Islands; December 28, 300–0 fathoms; 34 species**

Aetideus armatus
Arietellus armatus
Arietellus giesbrechti
Arietellus plumifer
Augaptilus longicaudatus
Candacia aethiopica
Candacia simplex
Centraugaptilus cucullatus
Centraugaptilus rattrayi
Disseta palumboi
Disseta scopularis
Euaugaptilus nodifrons
Euaugaptilus palumboi
Eucalanus elongatus
Euchaeta marina
Euchirella galeata
Euchirella rostrata
Gaetanus pileatus
Haloptilus longicornis
Heterorhabdus norvegicus
Lophothrix frontalis
Lucicutia flavicornis
Mecynocera clausi
Metridia princeps
Neocalanus robustior
Pachyptilus eurygnathus
Pareuchaeta tonsa
Phyllopus bidentatus
Pleuromamma robusta
Pleuromamma xiphias
Rhincalanus cornutus
Scottocalanus securifrons
Undeuchaeta plumosa
Undinula darwinii

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***4706. Lat. 14°19′ S., long. 98°46′ W.; Easter to Galápagos Islands; December 28, 1904; surface; 7 species**

Eucalanus attenuatus
Euchaeta marina
Lucicutia flavicornis
Neocalanus gracilis
Pontellopsis perspicax
Rhincalanus cornutus
Scolecithrix danae

***4707. Lat. 12°53′ S., long. 97°42′ W.; Easter to Galápagos Islands; December 29, 1904; 300–0 fathoms; 57 species**

Amallophora typica
Amallothrix gracilis
Amallothrix obtusifrons
Arietellus plumifer
Arietellus simplex
Augaptilus longicaudatus
Augaptilus megalurus
Bathycalanus richardi
Candacia pachydactyla
Centraugaptilus rattrayi
Centropages violaceus
Clausocalanus arcuicornis
Corycaeus flaccus
Disseta palumboi
Euaugaptilus squamatus
Eucalanus attenuatus
Eucalanus elongatus
Euchaeta marina
Euchaeta spinosa
Euchirella brevis
Euchirella galeata
Euchirella pulchra
Gaetanus kruppii
Gaetanus latifrons
Gaetanus miles
Gaetanus pileatus
Gaidius affinis
Gaidius brevicaudatus
Gaidius minutus
Gaussia princeps
Haloptilus longicornis
Haloptilus ornatus
Heterorhabdus norvegicus
Heterostylites longicornis
Lucicutia flavicornis
Lucicutia grandis
Mecynocera clausi
Megacalanus longicornis
Metridia curticauda
Metridia longa
Metridia princeps
Mormonilla phasma
Nannocalanus minor
Neocalanus robustior
Oncaea venusta
Onchocalanus cristatus
Pareuchaeta barbata
Pareuchaeta grandiremis
Pleuromamma abdominalis
Pleuromamma gracilis
Pleuromamma xiphias
Rhincalanus cornutus
Sapphirina opalina
Scolecithricella bradyi
Scolecithrix danae
Undinula darwinii
Xanthocalanus pinguis

***4708. Lat. 11°40′ S., long. 96°55′ W.; Easter to Galápagos Islands; December 29, 1904; surface; 7 species**

Euaugaptilus palumboi
Eucalanus attenuatus
Euchaeta marina
Gaetanus pileatus
Pleuromamma gracilis
Scolecithrix danae
Undinula darwinii

***4709. Lat. 10°15′ S. long. 95°41′ W.; Easter to Galápagos Islands; December 30, 1904; 300–0 fathoms; 7 species**

Eucalanus elongatus
Euchaeta marina
Metridia longa
Pareuchaeta gracilis
Pleuromamma gracilis
Pleuromamma xiphias
Rhincalanus minutus

***4710. Lat. 9°30′ S., long. 95°08′ W.; Easter to Galápagos Islands; December 30, 1904; surface; 6 species**

Euchirella bella
Nannocalanus minor
Pleuromamma gracilis
Pontellopsis regalis
Rhincalanus cornutus
Scolecithrix danae

***4711. Lat. 7°47′30″ S., long. 94°05′ W.; Easter to Galápagos Islands; December 31, 1904; 300–0 fathoms; 14 species**

Arietellus simplex
Centraugaptilus rattrayi
Disseta palumboi
Euaugaptilus squamatus
Eucalanus elongatus
Gaetanus kruppii
Gaidius brevispinus
Haloptilus fons
Lucicutia flavicornis
Megacalanus longicornis
Pachyptilus abbreviatus
Pareuchaeta barbata
Pareuchaeta grandiremis
Scaphocalanus magnus

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4712. Lat. 7°05′ S., long. 93°35′ W.; Easter to Galápagos Islands; December 31, 1904; surface; 2 species

Pontella securifer
Rhincalanus cornutus

***4713. Lat. 5°35′ S., long. 92°22′ W.; Easter to Galápagos Islands; January 1, 1905; 300–0 fathoms; 14 species**

Centraugaptilus rattrayi
Eucalanus attenuatus
Eucalanus elongatus
Eucalanus mucronatus
Eucalanus muticus
Eucalanus subtenuis
Euchaeta marina
Haloptilus longicornis
Pareuchaeta grandiremis
Rhincalanus cornutus
Rhincalanus nasutus
Sapphirina nigromaculata
Scolecithrix danae
Undinula darwinii

***4714. Lat. 4°19′ S., long 91°28′ W.; south of Galápagos Islands; January 1, 1905; surface; 8 species**

Candacia tenuimana
Corycaeus longistylis
Eucalanus attenuatus
Euchaeta marina
Labidocera acutifrons
Pontella danae
Scolecithrix danae
Undinula darwinii

***4715. Lat. 2°40′30″ S., long. 90°19′ W.; off Galápagos Islands; January 2, 1905; 300–0 fathoms; 34 species**

Amallothrix obtusifrons
Arietellus simplex
Augaptilus longicaudatus
Euaugaptilus nodifrons
Eucalanus attenuatus
Eucalanus elongatus
Eucalanus subtenuis
Euchaeta longicornis
Euchaeta marina
Euchirella bella
Euchirella galeata
Gaetanus kruppii
Gaidius brevispinus
Haloptilus longicornis
Haloptilus spiniceps
Hemirhabdus grimaldii
Heterorhabdus papilliger
Heterostylites longicornis
Lophothrix frontalis
Lucicutia grandis
Mecynocera clausi
Megacalanus longicornis
Nannocalanus minor
Onchocalanus hirtipes
Pareuchaeta barbata
Pareuchaeta grandiremis
Pleuromamma xiphias
Pseudeuchaeta brevicauda
Rhincalanus cornutus
Rhincalanus nasutus
Scaphocalanus magnus
Scottocalanus securifrons
Undeuchaeta major
Undinula darwinii

***4716. Lat. 2°18′30″ S., long. 90°02′30″ W.; off Galápagos Islands; January 2, 1905; surface; 21 species**

Amallothrix arcuata
Augaptilus longicaudatus
Candacia elongata
Copilia mirabilis
Copilia quadrata
Eucalanus attenuatus
Eucalanus elongatus
Eucalanus monachus
Eucalanus subcrassus
Euchaeta acuta
Euchaeta marina
Euchirella bella
Gaetanus kruppii
Lophothrix frontalis
Pontella danae
Rhincalanus cornutus
Rhincalanus nasutus
Scaphocalanus magnus
Scolecithrix danae
Undeuchaeta major
Undinula darwinii

***4717. Lat. 5°11′ S., long. 98°56′ W.; off Galápagos Islands; January 13, 1905; 300–0 fathoms; 40 species**

Aetideus armatus
Amallothrix gracilis
Amallothrix obtusifrons
Arietellus plumifer
Arietellus simplex
Bathypontia elongata
Centraugaptilus rattrayi
Disseta palumboi
Euaugaptilus angustus
Euraugaptilus bullifer
Euaugaptilus facilis
Euaugaptilus laticeps
Euaugaptilus longimanus
Euaugaptilus magnus
Euaugaptilus nodifrons
Euaugaptilus squamatus
Eucalanus elongatus
Euchirella galeata

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***4717. Lat. 5°11′ S., long. 98°56′ W.; off Galápagos Islands; January 13, 1905; 300–0 fathoms; 40 species—Continued**

Gaetanus kruppii
Gaetanus miles
Gaetanus recticornis
Gaussia princeps
Haloptilus longicornis
Lophothrix frontalis
Lucicutia flavicornis
Lucicutia grandis
Lucicutia longicornis
Metridia princeps
Onchocalanus trigoniceps
Pachyptilus eurygnathus
Pareuchaeta grandiremis
Phyllopus bidentatus
Pleuromamma abdominalis
Pleuromamma robusta
Pleuromamma xiphias
Rhincalanus cornutus
Sapphirina nigromaculata
Scaphocalanus magnus
Scaphocalanus medius
Scottocalanus securifrons

***4718. Lat. 5°32′30″ S., long. 99°32′ W.; off Galápagos Islands; January 13, 1905; surface; 3 species**

Eucalanus elongatus
Pontellopsis regalis
Rhincalanus cornutus

***4719. Lat. 6°30′ S., long. 101°17′ W.; Galápagos to Paumotu Islands; January 14, 1905; 300–0 fathoms; 45 species**

Amallothrix gracilis
Amallothrix obtusifrons
Arietellus plumifer
Arietellus simplex
Augaptilus anceps
Bathypontia elongata
Cephalophanes refulgens
Disseta palumboi
Euaugaptilus angustus
Euaugaptilus squamatus
Eucalanus attenuatus
Eucalanus elongatus
Eucalanus muticus
Euchaeta spinosa
Euchirella galeata
Gaetanus armiger
Gaetanus curvispinus
Gaetanus kruppii
Gaetanus microcanthus
Gaetanus miles
Gaetanus minor
Gaetanus pileatus
Gaetanus recticornis
Haloptilus longicornis
Hemirhabdus latus
Heterorhabdus papilliger
Heterostylites longicornis
Lucicutia grandis
Metridia princeps
Nannocalanus minor
Pachyptilus abbreviatus
Pareuchaeta barbata
Pareuchaeta grandiremis
Phaënna spinifera
Phyllopus bidentatus
Pleuromamma abdominalis
Pleuromamma gracilis
Pleuromamma robusta
Pleuromamma xiphias
Pontellopsis regalis
Rhincalanus cornutus
Scaphocalanus affinis
Scaphocalanus magnus
Scolecithrix danae
Valdiviella insignis

4720. Lat. 7°13′ S. long. 102°31′30″ W.; Galápagos to Paumotu Islands; January 14, 1905; surface; 2 species

Labidocera detruncata
Scottocalanus securifrons

***4721. Lat. 8°07′30″ S., long. 104°10′ W.; Galápagos to Paumotu Islands; January 16, 1905; 300–0 fathoms; 45 species**

Amallothrix gracilis
Amallothrix obtusifrons
Arietellus setosus
Augaptilus anceps
Augaptilus longicaudatus
Candacia pachydactyla
Candacia simplex
Centropages violaceus
Euaugaptilus nodifrons
Euaugaptilus squamatus
Eucalanus elongatus
Eucalanus muticus
Euchaeta acuta
Euchaeta marina
Euchirella brevis
Euchirella curticauda
Euchirella galeata
Euchirella intermedia
Euchirella pulchra
Euchirella venusta
Gaetanus curvispinus
Gaetanus miles
Gaetanus pileatus
Gaidius brevispinus
Haloptilus longicornis
Haloptilus ornatus
Hemirhabdus grimaldii
Heterorhabdus papilliger
Heterorhabdus spinifrons
Isochaeta ovalis
Labidocera detruncata
Lophothrix frontalis
Lucicutia grandis

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***4721. Lat. 8°07'30" S., long. 104°10' W.; Galápagos to Paumotu Islands; January 16, 1905; 300–0 fathoms; 45 species—Continued**

Metridia curticauda
Nannocalanus minor
Neocalanus gracilis
Pachos punctatum
Pareuchaeta barbata
Pareuchaeta grandiremis
Pleuromamma abdominalis
Pleuromamma xiphias
Rhincalanus cornutus
Sapphirina metallina
Scolecithrix danae
Scottocalanus securifrons

***4722. Lat. 9°31' S., long. 106°30' W.; Galápagos to Paumotu Islands; January 16, 1905; 300–0 fathoms; 52 species**

Acrocalanus monachus
Amallothrix gracilis
Amallothrix obtusifrons
Arietellus armatus
Arietellus pavoninus
Arietellus plumifer
Augaptilus longicaudatus
Candacia simplex
Centraugaptilus cucullatus
Disseta palumboi
Disseta scopularis
Euaugaptilus nodifrons
Euaugaptilus palumboi
Euaugaptilus squamatus
Eucalanus elongatus
Eucalanus muticus
Euchaeta marina
Euchaeta spinosa
Euchirella brevis
Euchirella pulchra
Euchirella venusta
Gaetanus armiger
Gaetanus curvispinus
Gaetanus kruppii
Gaetanus microcanthus
Gaetanus miles
Gaetanus minor
Gaetanus pileatus
Gaetanus recticornis
Hemirhabdus latus
Heterorhabdus papilliger
Heterorhabdus spinifrons
Heterostylites longicornis
Labidocera detruncata
Lophothrix frontalis
Lucicutia flavicornis
Lucicutia grandis
Metridia curticauda
Metridia princeps
Neocalanus gracilis
Neocalanus robustior
Pareuchaeta barbata
Pareuchaeta grandiremis
Phyllopus bidentatus
Pleuromamma gracilis
Pleuromamma xiphias
Rhincalanus cornutus
Scaphocalanus affinis
Scolecithrix danae
Scottocalanus securifrons
Undeuchaeta major
Undinula darwinii

***4723. Lat. 10°14' S., long. 107°45' W.; Galápagos to Paumotu Islands; January 16, 1905; surface; 5 species**

Conaea gracilis
Eucalanus attenuatus
Gaetanus miles
Labidocera detruncata
Nannocalanus minor

***4724. Lat. 11°13'30" S., long. 109°29' W.; Galápagos to Paumotu Islands; January 17, 1905; 300–0 fathoms; 10 species**

Candacia aethiopica
Candacia tenuimana
Euchaeta marina
Haloptilus longicornis
Hemirhabdus grimaldii
Pachos punctatum
Pareuchaeta bradyi
Pleuromamma xiphias
Rhincalanus cornutus
Scolecithrix danae

***4725. Lat. 11°38' S., long. 110°05' W.; Galápagos to Paumotu Islands; January 17, 1905; surface; 5 species**

Candacia aethiopica
Heterorhabdus papilliger
Labidocera detruncata
Neocalanus gracilis
Scaphocalanus affinis

4727. Lat. 13°00' S., long. 112°45' W.; Galápagos to Paumotu Islands; January 18, 1905; surface; 1 species

Amallothrix obtusifrons

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***4728. Lat. 13°47′30″ S., long. 114°22′ W.; Galápagos to Paumotu Islands; January 19, 1905; 800–0 fathoms; 3 species**

Labidocera detruncata
Pleuromamma gracilis
Rhincalanus cornutus.

***4730. Lat. 15°07′ S., long. 117°01′ W.; Galápagos to Paumotu Islands; January 20, 1905; 300–0 fathoms; 35 species**

Amallothrix obtusifrons
Arietellus armatus
Arietellus plumifer
Arietellus setosus
Augaptilus longicaudatus
Candacia aethiopica
Candacia pachydactyla
Candacia simplex
Centraugaptilus rattrayi
Cephalophanes refulgens
Disseta palumboi
Disseta scopularis
Euaugaptilus longimanus
Euaugaptilus palumboi
Eucalanus attenuatus
Euchaeta marina
Euchirella curticauda
Gaetanus miles
Gaetanus pileatus
Haloptilus chierchiae
Haloptilus longicornis
Haloptilus spiniceps
Heteroptilus attenuatus
Heterorhabdus papilliger
Heterorhabdus spinifrons
Neocalanus robustior
Pareuchaeta tonsa
Pleuromamma abdominalis
Pleuromamma gracilis
Pleuromamma xiphias
Rhincalanus cornutus
Scolecithrix danae
Scottocalanus securifrons
Undeuchaeta plumosa
Undinula darwinii

***4731. Lat. 15°47′ S., long. 118°22′30″ W.; Galápagos to Paumotu Islands; January 20, 1905; surface; 14 species**

Candacia aethiopica
Centropages violaceus
Corycaeus longistylis
Corycaeus speciosus
Eucalanus attenuatus
Euchaeta concinna
Euchaeta marina
Labidocera detruncata
Neocalanus gracilis
Neocalanus robustior
Oncaea venusta
Pontella atlantica
Sapphirina opalina
Sapphirina sali

***4732. Lat. 16°32′00″ S., long. 119°59′ W.; Galápagos to Paumotu Islands; January 21, 1905; 300–0 fathoms; 11 species**

Euaugaptilus bullifer
Euchirella brevis
Euchirella messinensis
Euchirella pulchra
Gaetanus pileatus
Macandrewella chelipes
Pleuromamma xiphias
Scolecithrix danae
Scottocalanus persecans
Scottocalanus securifrons
Undeuchaeta major

4733. Lat. 16°57′30″ S., long. 120°48′ W.; Galápagos to Paumotu Islands; January 21, 1905; surface; 1 species

Sapphirina nigromaculata

***4734. Lat. 17°26′ S., long. 122°15′ W.; Galápagos to Paumotu Islands; January 22, 1905; 300–0 fathoms; 28 species**

Acrocalanus gracilis
Aegisthus mucronatus
Arietellus armatus
Arietellus setosus
Centraugaptilus rattrayi
Conaea gracilis
Euaugaptilus longimanus
Euaugaptilus squamatus
Eucalanus attenuatus
Euchaeta marina
Euchirella brevis
Euchirella pulchra
Euchirella venusta
Gaetanus miles
Gaetanus minor
Gaetanus pileatus
Haloptilus longicornis
Macandrewella sewelli
Neocalanus robustior
Pachos punctatum
Pleuromamma abdominalis
Pleuromamma xiphias
Rhincalanus cornutus
Scolecithrix danae
Scottocalanus persecans
Scottocalanus securifrons
Temora discaudata
Undinula darwinii

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***4735. Lat. 18°16′ S. long. 123°34′ W.; Galápagos to Paumotu Islands; January 22, 1905; surface; 3 species**

Labidocera detruncata
Pontella tenuiremis
Pontellina plumata

***4736. Lat. 19°00′ S., long. 125°05′ W.; Galápagos to Paumotu Islands; January 23, 1905; 300–0 fathoms; 3 species**

Candacia longimana
Euchirella venusta
Scottocalanus securifrons

4737. Lat. 19°57′30″ S., long. 127°20′ W.; Galápagos to Paumotu Islands; January 24, 1905; 300–0 fathoms; 1 species

Centraugaptilus rattrayi

***4738. Lat. 20°26′30″ S., long. 128°30′ W.; Galápagos to Paumotu Islands; January 24, 1905; surface; 11 species**

Candacia aethiopica
Candacia longimana
Centropages violaceus
Cephalophanes refulgens
Euchaeta marina
Labidocera detruncata
Nannocalanus minor
Neocalanus gracilis
Pontella tenuiremis
Rhincalanus cornutus
Undinula vulgaris

***4740. Lat. 9°02′ S., long. 123°20′ W.; off Paumotu Islands; February 11, 1905; 300–0 fathoms; 29 species**

Arietellus setosus
Arietellus simplex
Arietellus tripartitus
Bathypontia elongata
Chirundina streetsi
Disseta scopularis
Euaugaptilus bullifer
Euchaeta acuta
Euchirella pulchra
Gaetanus armiger
Gaetanus miles
Gaidius pungens
Haloptilus longicornis
Labidocera detruncata
Lophothrix frontalis
Lucicutia flavicornis
Metridia curticauda
Metridia princeps
Neocalanus robustior
Onchocalanus trigoniceps
Phyllopus bidentatus
Pleuromamma abdominalis
Pleuromamma xiphias
Rhincalanus cornutus
Scaphocalanus affinis
Scolecithrix danae
Scottocalanus securifrons
Undeuchaeta major
Undeuchaeta plumosa

***4741. Lat. 8°29′ S., long. 122°56′ W.; Paumotu Islands to Mexico; February 11, 1905; surface; 3 species**

Centropages violaceus
Labidocera detruncata
Pontella danae

***4742. Lat. 00°04′ S., long. 117°07′ W.; Paumotu Islands to Mexico; February 15, 1905; 300–0 fathoms; 6 species**

Arietellus plumifer
Euchirella curticauda
Euchirella galeata
Pleuromamma xiphias
Scottocalanus securifrons
Undinula darwinii

***4743. Lat. 00°21′ N., long. 117°02′30″ W.; Paumotu Islands to Mexico; February 15, 1905; surface; 11 species**

Arietellus plumifer
Candacia pachydactyla
Candacia simplex
Eucalanus monachus
Labidocera detruncata
Nannocalanus minor
Paracalanus aculeatus
Pleuromamma xiphias
Pontellina plumata
Pontellopsis regalis
Undinula caroli

4745. Lat. 53°59′45″ N., long. 130°11′37″ W.; Seattle to Yes Bay, Alaska; June 28, 1905; 15–0 fathoms; 1 species

Eucalanus elongatus

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4746. Lat. 55°02′45″ N., 131°06′39″ W.; Seattle to Yes Bay, Alaska; June 28, 1905; 120–0 fathoms; 1 species

Pleuromamma xiphias

***4747. Lat. 55°44′23″ N., long. 131°45′13″ W.; Yes Bay, Alaska; June 30, 1905; 275–0 fathoms; 4 species**

Calanus cristatus
Calanus hyperboreus
Metridia princeps
Pachyptilus abbreviatus

***4750. Lat. 55°35′15″ N., long. 132°33′ W.; coast of Alaska; August 19, 1905; 175–0 fathoms; 4 species**

Euchirella brevis
Euchirella messinensis
Euchirella pulchra
Neocalanus gracilis

4751. Lat. 55°56′50″ N., long. 132°04′20″ W.; coast of Alaska; August 30, 1905; 175–0 fathoms; 2 species

Candacia simplex
Scolecithrix danae

***4753. Lat. 55°41′30″ N., long. 131°46′12″ W.; Yes Bay to Seattle; October 1, 1905; 150–0 fathoms; 8 species**

Calanus finmarchicus
Candacia simplex
Gaetanus minor
Gaidius affinis
Heterorhabdus papilliger
Lucicutia flavicornis
Pareuchaeta sarsi
Rhincalanus nasutus

***4756. Lat. 47°37′48″ N., long. 122°26′20″ W.; off Washington; November 16, 1905; 75–0 fathoms; 13 species**

Acartia clausii
Acartia danae
Acartia longiremis
Calanus finmarchicus
Corycaeus catus
Corycaeus speciosus
Farranula gracilis
Farranula rostrata
Metridia brevicauda
Oithona similis
Paracalanus parvus
Pseudocalanus minutus
Tortanus discaudatus

***4757. Lat. 39°18′ N., long. 123°58′ W.; off California; May 4, 1906; 100–0 fathoms; 20 species**

Calanus cristatus
Calanus finmarchicus
Candacia armata
Eucalanus attenuatus
Eucalanus mucronatus
Eucalanus muticus
Euchaeta spinosa
Euchirella bitumida
Euchirella brevis
Euchirella galeata
Euchirella intermedia
Gaetanus pileatus
Metridia longa
Pareuchaeta barbata
Pareuchaeta tonsa
Pleuromamma abdominalis
Pleuromamma gracilis
Pleuromamma xiphias
Scolecithricella dentata
Undeuchaeta major

***4758. Lat. 52°02′ N., long. 132°53′ W.; off Queen Charlotte Islands; May 19, 1906; 300–0 fathoms; 20 species**

Aetideus armatus
Arietellus simplex
Calanus cristatus
Calanus finmarchicus
Calanus tonsus
Euaetideus bradyi
Eucalanus attenuatus
Eucalanus monachus
Euchirella bitumida
Euchirella galeata
Gaetanus armiger
Gaidius brevispinus
Gaussia princeps
Metridia longa
Pareuchaeta norvegica
Pleuromamma abdominalis
Pseudocalanus minutus
Scaphocalanus echinatus
Scolecithricella dentata
Tortanus discaudatus

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***4759. Lat. 53°05′ N., long. 138°31′ W.; coast of British Columbia; May 20, 1906; 300–0 fathoms; 12 species**

Calanus cristatus
Calanus finmarchicus
Calanus helgolandicus
Eucalanus elongatus
Heterorhabdus papilliger
Megacalanus princeps
Metridia lucens
Metridia princeps
Oithona similis
Pareuchaeta gracilis
Pareuchaeta hansenii
Scolecithricella minor

***4760. Lat. 53°53′ N., long. 144°53′ W.; coast of British Columbia; May 21, 1906; 300–0 fathoms; 21 species**

Calanus cristatus
Calanus finmarchicus
Eucalanus attenuatus
Eucalanus elongatus
Eucalanus monachus
Eucalanus mucronatus
Euchaeta spinosa
Gaidius affinis
Gaidius brevispinus
Heterorhabdus papilliger
Megacalanus princeps
Metridia longa
Neocalanus gracilis
Pachyptilus abbreviatus
Pachyptilus eurygnathus
Pareuchaeta gracilis
Pareuchaeta norvegica
Pareuchaeta sarsi
Pleuromamma gracilis
Pleuromamma quadrungulata
Pseudocalanus minutus

4761. Lat. 53°57′30″ N., long. 159°31′ W.; Shumagin Islands; May 23, 1906; depth not given; 2 species

Paraugaptilus buchani
Sapphirina intestinata

4762. Lat 53°46′ N., long. 164°29′ W.; southeast of Ugamak Island; May 24, 1906; 50–0 fathoms; 1 species

Calanus finmarchicus

4763. Lat. 53°57′ N., long. 168°06′ W.; south of Bogoslof Islands; May 28, 1906; 300–0 fathoms; 2 species

Calanus cristatus
Eucalanus mucronatus

4765. Lat. 53°12′ N., long. 171°37′ W.; off Atka Island; May 29, 1906; 300–0 fathoms; 11 species

Bathycalanus richardi
Calanus cristatus
Eucalanus attenuatus
Eucalanus crassus
Eucalanus elongatus
Pachyptilus eurygnathus
Pareuchaeta barbata
Pareuchaeta bisinuata
Pareuchaeta norvegica
Pontellina plumata
Pontellopsis perspicax

4766. Lat. 52°38′ N., long. 174°49′ W.; off Konivji Island; May 31, 1906; 300–0 fathoms; 6 species

Arietellus simplex
Calanus cristatus
Calanus tonsus
Eucalanus elongatus
Pleuromamma gracilis
Pleuromamma xiphias

4767. Lat. 54°12′ N., long. 179°07′30″ E.; Bering Sea; June 3, 1906; 300–0 fathoms; 2 species

Calanus finmarchicus
Eucalanus monachus

4774. Lat. 54°33′ N., long. 178°45′ E.; Bering Sea, June 4, 1906; bottom; 1 species

Eucalanus elongatus

4781. Lat. 52°14′30″ N., long. 174°13′ E.; off Agattu, Aleutian Islands; June 7, 1906; 300–0 fathoms; 1 species

Calanus cristatus

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4783. Lat. 52°55'30" N., long. 173°30' E.; off Attu, Aleutian Islands; June 9, 1906; 30–0 fathoms; 1 species

Eucalanus elongatus

4785. Lat. 53°20' N., long. 170°33' E.; off Attu, Aleutian Islands; June 12, 1906; 300–0 fathoms; 11 species

Acartia clausii
Calanus cristatus
Calanus finmarchicus
Candacia norvegica
Canthocalanus pauper
Eucalanus attenuatus
Eucalanus elongatus
Eucalanus muticus
Heterorhabdus papilliger
Metridia longa
Pleuromamma robusta

4793. Lat. 54°48' N., long. 164°54' E.; southwest of Bering Island; June 16, 1906; 300–0 fathoms; 18 species

Calanus cristatus
Calanus hyperboreus
Calanus tonsus
Candacia armata
Disseta palumboi
Eucalanus attenuatus
Eucalanus elongatus
Eucalanus mucronatus
Euchaeta spinosa
Euchirella brevis
Gaetanus kruppii
Gaidius brevispinus
Metridia longa
Pachos punctatum
Pachyptilus eurygnathus
Pareuchaeta norvegica
Pleuromamma gracilis
Scaphocalanus magnus

4800. Lat. 49°06' N., long. 153°06' E.; north of Chirinkotan Island; June 22, 1906; 300–0 fathoms; 6 species

Calanus finmarchicus
Eucalanus monachus
Mesorhabdus angustus
Metridia longa
Metridia princeps
Pareuchaeta sarsi

4805. Lat. 44°33' N., long. 149°04' E.; off Hakodate, Japan; June 25, 1906; 200–0 fathoms; 2 species

Calanus cristatus
Calanus hyperboreus

4806. Lat. 42°13' N., long. 144°21' E.; off Hokkaido, Japan; June 26, 1906; 200–0 fathoms; 15 species

Calanus cristatus
Calanus finmarchicus
Calanus hyperboreus
Candacia norvegica
Eucalanus attenuatus
Eucalanus elongatus
Eucalanus mucronatus
Gaetanus curvispinus
Gaidius brevispinus
Metridia longa
Microsetella rosea
Paracalanus parvus
Pareuchaeta norvegica
Pleuromamma gracilis
Pseudocalanus minutus

4810. Lat. 41°17'20" N., long. 140°07' E.; Sea of Japan; July 16, 1906; 100–0 fathoms; 1 species

Bathycalanus richardi

4850. Lat. 36°56' N., long. 132°00' E.; Sea of Japan; July 27, 1906; surface; 2 species

Nannocalanus minor
Scolecithricella vittata

4889. Lat. 32°26' N., long. 129°22' E.; Kagoshima Gulf, Japan; August 8, 1906; surface; 1 species

Clausocalanus arcuicornis

4915. Lat. 31°31' N., long. 129°25'30" E.; southwest of Koshika Islands, Eastern Sea of Japan; August 12, 1906; [surface?]; 1 species

Euchaeta marina

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4926. Off Yaku Shima Island, Japan; August 14, 1906; 100–0 fathoms; 46 species

Acartia longiremis
Acrocalanus gracilis
Candacia simplex
Canthocalanus pauper
Centropages calaninus
Copilia mirabilis
Copilia quadrata
Corycaeus agilis
Corycaeus lautus
Corycaeus longistylis
Corycaeus speciosus
Eucalanus attenuatus
Eucalanus crassus
Eucalanus elongatus
Eucalanus mucronatus
Eucalanus subcrassus
Euchaeta marina
Euchaeta spinosa
Euchirella brevis
Euchirella curticauda
Euchirella intermedia
Euchirella messinensis
Gaidius tenuispinus
Haloptilus longicornis
Haloptilus ornatus
Labidocera lubbockii
Lucicutia flavicornis
Neocalanus gracilis
Neocalanus robustior
Neocalanus tenuicornis
Oithona similis
Oncaea minuta
Paracalanus parvus
Phaënna spinifera
Pleuromamma abdominalis
Pleuromamma gracilis
Pleuromamma xiphias
Rhincalanus cornutus
Sapphirina angusta
Sapphirina ovatolanceolata
Scolecithrix danae
Temora stylifera
Undeuchaeta major
Undeuchaeta plumosa
Undinula caroli
Undinula vulgaris

4942. Lat. 31°23′10″ N., long. 130°39′10″ E.; Kagoshima Gulf, Japan; August 17, 1906; 118–0 fathoms; 1 species

Neocalanus tenuicornis

4952. Lat. 31°19′ N., long. 132°11′30″ E.; Bungo Channel, Japan; August 21, 1906; surface; 41 species

Acartia danae
Acrocalanus gracilis
Calanopia minor
Caligus latifrons
Candacia aethiopica
Candacia bispinosa
Candacia simplex
Cephalophanes refulgens
Copilia mirabilis
Copilia quadrata
Eucalanus attenuatus
Eucalanus elongatus
Eucalanus monachus
Euchaeta marina
Euchaeta spinosa
Farranula carinata
Farranula gibbula
Labidocera acuta
Labidocera acutifrons
Labidocera detruncata
Labidocera krøyeri
Labidocera minuta
Macrosetella gracilis
Nannocalanus minor
Neocalanus gracilis
Neocalanus tenuicornis
Oncaea minuta
Paracalanus parvus
Pleuromamma abdominalis
Pleuromamma xiphias
Pontella atlantica
Pontella danae
Pontella lobiancoi
Pontella securifer
Pontellina plumata
Pontellopsis villosus
Sapphirina auronitens
Temora longicornis
Temora stylifera
Undinula vulgaris
Vettoria granulosa

5030. Lat. 46°29′30″ N., long. 145°46′ E.; Okhotsk Sea; September 29, 1906; depth not given; 14 species

Bradyidius similis
Calanus cristatus
Calanus finmarchicus
Calanus tonsus
Eucalanus attenuatus
Eucalanus mucronatus
Euchaeta acuta
Gaidius tenuispinus
Metridia longa
Metridia lucens
Neocalanus robustior
Paracalanus parvus
Pareuchaeta erebi
Pseudocalanus minutus

5063. Lat. 35°01′10″ N., long. 138°38′50″ E.; Suruga Gulf, Japan; October 13, 1906; 300–0 fathoms; 2 species

Pareuchaeta sarsi
Pleuromama xiphias

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5102. Lat. 14°45′ N., long. 120°12′30″ E.; off southern Luzón, Philippine Islands; January 6, 1908; 28–0 fathoms; 34 species

Acartia danae
Calanopia elliptica
Calanopia minor
Candacia aethiopica
Candacia simplex
Candacia turgida
Canthocalanus pauper
Centropages furcatus
Copilia mirabilis
Copilia quadrata
Corycaeus agilis
Corycaeus speciosus
Eucalanus elongatus
Eucalanus mucronatus
Eucalanus subcrassus
Euchaeta marina
Euchirella bella
Farranula concinna
Labidocera acuta
Labidocera laevidentata
Lucicutia curta
Lucicutia longicornis
Macrosetella gracilis
Oncaea venusta
Phaënna spinifera
Pontellina plumata
Pseudocalanus minutus
Sapphirina metallina
Sapphirina opalina
Sapphirina salpae
Scolecithrix danae
Temora stylifera
Tortanus gracilis
Undinula vulgaris

5105. Lat. 14°43′55″ N., long. 120°12′50″ E., off southern Luzón, Philippine Islands; January 8, 1908; surface; 14 species

Calanopia thompsoni
Candacia aethiopica
Candacia armata
Candacia bispinosa
Candacia pachydactyla
Euchaeta marina
Labidocera acuta
Labidocera acutifrons
Labidocera pavo
Pontella valida
Pontellopsis bitumida
Sapphirina opalina
Scaphocalanus insolitus
Undinula vulgaris

5110. Lat. 13°59′20″ N., long. 120°75′45″ E.; southern Luzón, Philippine Islands; January 16, 1908; surface; 6 species

Candacia bispinosa
Eucalanus elongatus
Labidocera acuta
Pleuromamma gracilis
Pleuromamma piseki
Pontella surrecta

5120. Lat. 13°45′30″ N., long. 120°30′15″ E.; west of Lubang, Philippine Islands; January 21, 1908; 350–0 fathoms; 110 species

Acartia danae
Acrocalanus gracilis
Aegisthus mucronatus
Aegisthus spinulosus
Amallothrix emarginata
Amallothrix lobata
Arietellus plumifer
Arietellus simplex
Augaptilus anceps
Augaptilus megalurus
Bathycalanus richardi
Bathypontia minor
Candacia aethiopica
Candacia armata
Candacia simplex
Canthocalanus pauper
Centraugaptilus horridus
Centraugaptilus rattrayi
Centropages violaceus
Copilia quadrata
Corycaeus agilis
Corycaeus dubius
Corycaeus latus
Corycaeus longistylis
Corycaeus pacificus
Corycaeus pumilus
Corycaeus speciosus
Euaetideus bradyi
Euaetideus giesbrechti
Eucalanus attenuatus
Eucalanus bungii
Eucalanus elongatus
Eucalanus mucronatus
Eucalanus subtenuis
Euchaeta marina
Euchaeta spinosa
Euchaeta wolfendeni
Euchirella bitumida
Euchirella curticauda
Euchirella galeata
Euchirella intermedia
Euchirella messinensis
Euchirella pulchra
Farranula carinata
Gaetenus kruppii
Gaetanus latifrons
Gaetanus miles
Gaetanus minor
Gaetanus pileatus
Gaidius affinis
Haloptilus angusticeps
Haloptilus longicornis
Haloptilus ornatus
Hemirhabdus grimaldii
Heterorhabdus abbyssalis
Heterorhabdus papilliger
Heterostylites longicornis
Lophothrix frontalis
Lophothrix latipes
Lucicutia curta
Lucicutia flavicornis
Lucicutia gemina
Lucicutia longicornis
Lucicutia lucida
Lucicutia macrocera
Lucicutia ovalis

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5120. Lat. 13°45′30″ N., long. 120°30′15″ E.; west of Lubang, Philippine Islands; 350–0 fathoms; 110 species—Continued

Lucicutia tenuicauda
Macrosetella gracilis
Mecynocera clausi
Megacalanus longicornis
Metridia longa
Metridia princeps
Monacilla typica
Nannocalanus minor
Neocalanus gracilis
Neocalanus robustior
Oithona linearis
Oithona similis
Oithona spinirostris
Oncaea conifera
Oncaea minuta
Onchocalanus affinis
Onchocalanus hirtipes
Paracalanus parvus
Pareuchaeta bradyi
Pareuchaeta hansenii
Pareuchaeta tonsa
Pareuchaeta tumidula
Phyllopus helgae
Phyllopus impar
Pleuromamma abdominalis
Pleuromamma gracilis
Pleuromamma robusta
Pleuromamma xiphias
Pseudocalanus minutus
Pseudochirella obtusa
Rhincalanus cornutus
Rhincalanus nasutus
Sapphirina auronitens
Scaphocalanus affinis
Scaphocalanus magnus
Scaphocalanus medius
Scolecithricella bradyi
Scolecithricella dentata
Scottocalanus securifrons
Scottocalanus thomasi
Undeuchaeta major
Undeuchaeta plumosa
Undinula caroli
Undinula vulgaris

5125. Lat. 10°48′ N., long. 121°48′30″ E.; Sulu Sea, off southern Panay, Philippine Islands; February 3, 1908; 365–0 fathoms; 6 species

Acartia danae
Eucalanus attenuatus
Eucalanus mucronatus
Pleuromamma gracilis
Pleuromamma xiphias
Rhincalanus cornutus

5126. Lat. 10°34′45″ N., long. 121°47′30″ E.; Sulu Sea, off southern Panay, Philippine Islands; February 3, 1908; surface; 6 species

Rhincalanus cornutus
Rhincalanus nasutus
Sapphirina angusta
Sapphirina ovatolanceolata
Undinula caroli
Undinula vulgaris

5128. Lat. 9°52′10″ N., long. 121°49′35″ E.; Sulu Sea, vicinity southern Panay, Philippine Islands; February 4, 1908; surface; 1 species

Labidocera krøyeri

5129. Lat. 7°41′30″ N., long. 122°01′45″ E.; Sulu Sea, off Mindanao, Philippine Islands; February 5, 1908; 100–0 fathoms; 71 species

Calanoides brevicornis
Candacia armata
Candacia bipinnata
Candacia bispinosa
Candacia norvegica
Candacia simplex
Canthocalanus pauper
Centropages furcatus
Clausocalanus arcuicornis
Copilia quadrata
Corycaeus latus
Corycaeus longistylis
Corycaeus ovalis
Corycaeus speciosus
Disseta palumboi
Euaetideus giesbrechti
Euaugaptilus laticeps
Eucalanus attenuatus
Eucalanus crassus
Eucalanus elongatus
Eucalanus monachus
Eucalanus mucronatus
Eucalanus pileatus
Eucalanus subcrassus
Euchaeta acuta
Euchaeta marina
Euchaeta spinosa
Euchirella brevis
Euchirella curticauda
Heterorhabdus papilliger
Heterorhabdus spinifrons
Heterostylites longicornis
Labidocera minuta
Lucicutia curta
Lucicutia flavicornis
Lucicutia lucida
Lucicutia ovalis
Metridia curticauda
Nannocalanus minor
Neocalanus gracilis
Neocalanus robustior
Oithona similis
Oncaea minuta
Paracalanus parvus
Pareuchaeta erebi

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5129. Lat. 7°41′30″ N., long. 122°01′45″ E.; Sulu Sea, off Mindanao, Philippine Islands; February 5, 1908; 100–0 fathoms; 71 species—Continued

Pareuchaeta gracilis
Pareuchaeta incisa
Phaënna spinifera
Pleuromamma abdominalis
Pleuromamma gracilis
Pleuromamma robusta
Pleuromamma xiphias
Pontellopsis armata
Pseudocalanus minutus
Pseudochirella divaricata
Rhincalanus cornutus
Rhincalanus nasutus
Sapphirina metallina
Sapphirina nigromaculata
Sapphirina opalina
Scaphocalanus magnus
Scolecithricella abyssalis
Scolecithricella auropecten
Scolecithricella bradyi
Scolecithricella dentata
Scolecithrix danae
Temora longicornis
Temora stylifera
Tortanus gracilis
Tortanus murrayi
Undinula caroli

5130. Lat. 7°35′ N., long. 122°04′45″ E.; Sulu Sea; February 5, 1908; bottom; 1 species

Eucalanus bungii

5133. Off Mindanao west, Philippine Islands; February 6, 1908; surface; 43 species

Acartia danae
Acrocalanus gracilis
Calanopia elliptica
Calanopia minor
Candacia aethiopica
Candacia bipinnata
Centropages furcatus
Corycaeus agilis
Corycaeus catus
Corycaeus lautus
Corycaeus longistylis
Corycaeus speciosus
Cymbasoma rigidum
Eucalanus attenuatus
Eucalanus elongatus
Euchaeta marina
Farranula carinata
Farranula gibbula
Farranula rostrata
Labidocera acuta
Labidocera krøyeri
Labidocera minuta
Macrosetella gracilis
Neocalanus gracilis
Neocalanus robustior
Oithona similis
Oncaea minuta
Oncaea similis
Oncaea venusta
Pleuromamma abdominalis
Pontella securifer
Pontella valida
Pontellina plumata
Pontellopsis regalis
Pontellopsis strenua
Pseudocalanus minutus
Rhincalanus cornutus
Sapphirina opalina
Scolecithrix danae
Temora discaudata
Temora longicornis
Temora stylifera
Undinula vulgaris

5134. Lat. 6°44′12″ N., long. 121°46′55″ E.; Sulu Archipelago, near Basilan Island; February 7, 1908; 25–0 fathoms; 36 species

Acartia danae
Acrocalanus gracilis
Calanopia minor
Candacia bispinosa
Candacia simplex
Centropages furcatus
Copilia quadrata
Corycaeus agilis
Corycaeus longistylis
Corycaeus pacificus
Corycaeus pumilus
Eucalanus attenuatus
Eucalanus crassus
Eucalanus subcrassus
Eucalanus subtenuis
Euchaeta marina
Farranula concinna
Haloptilus mucronatus
Heterorhabdus spinifrons
Labidocera acuta
Labidocera krøyeri
Neocalanus gracilis
Oncaea minuta
Paracalanus parvus
Phaënna spinifera
Pontellina plumata
Pontellopsis strenua
Rhincalanus cornutus
Rhincalanus nasutus
Sapphirina auronitens
Sapphirina opalina
Scolecithrix danae
Temora stylifera
Undinula caroli
Undinula darwinii
Undinula vulgaris

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5155. Lat. 5°13′40″ N., long. 119°57′20″ E.; Tawi Tawi Group, Sulu Archipelago; February 19, 1908; 8 fathoms; 34 species

Acartia danae
Acrocalanus monachus
Amenophia peltata
Candacia bipinnata
Candacia longimana
Centropages furcatus
Copilia mirabilis
Corycaeus agilis
Corycaeus dubius
Corycaeus lautus
Corycaeus speciosus
Eucalanus attenuatus
Eucalanus elongatus
Euchaeta marina
Labidocera acutifrons
Labidocera detruncata
Nannocalanus minor
Neocalanus gracilis
Oithona similis
Oncaea venusta
Paracalanus parvus
Phaënna spinifera
Pleuromamma xiphias
Pontella securifer
Pontellina plumata
Pseudocalanus minutus
Sapphirina iris
Sapphirina metallina
Sapphirina nigromaculata
Scolecithrix danae
Temora stylifera
Undeuchaeta major
Undinula darwinii
Undinula vulgaris

5171. Lat. 5°05′ N., long. 119°28′ E.; Sulu Archipelago; February 28, 1908; surface; 1 species

Acartia laxa

5175. Lat. 9°21′ N., long. 121°37′45″ E.; Sulu Sea; March 8, 1908; surface; 48 species

Acartia danae
Acartia discaudata
Acartia laxa
Acartia negligens
Acrocalanus gibber
Acrocalanus gracilis
Calanopia aurivilli
Calanopia elliptica
Calanopia minor
Calocalanus pavo
Candacia armata
Candacia bispinosa
Candacia simplex
Canthocalanus pauper
Centropages furcatus
Copilia quadrata
Corycaeus latus
Corycaeus pumilus
Corycaeus speciosus
Eucalanus attenuatus
Eucalanus crassus
Eucalanus elongatus
Euchaeta marina
Farranula carinata
Farranula gibbula
Farranula rostrata
Gaidius brevispinus
Labidocera acuta
Labidocera euchaeta
Labidocera minuta
Metridia longa
Microsetella norvegica
Nannocalanus minor
Neocalanus gracilis
Oithona similis
Oncaea ornata
Oncaea venusta
Pontella valida
Pontellina plumata
Pontellopsis armata
Pontellopsis bitumida
Temora longicornis
Temora stylifera
Temora turbinata
Tortanus barbatus
Tortanus gracilis
Tortanus murrayi
Undinula vulgaris

5176. Lat. 13°35′15″ N., long. 120°53′20″ E.; Verde Island Passage, Philippine Islands; March 24, 1908; surface; 22 species

Acartia danae
Acartia discaudata
Acartia negligens
Calanopia aurivillii
Centropages furcatus
Corycaeus latus
Corycaeus pumilus
Eucalanus elongatus
Farranula gibbula
Farranula rostrata
Gaidius brevispinus
Metridia longa
Microsetella norvegica
Oithona similis
Pontella valida
Pontellopsis regalis
Temora longicornis
Temora stylifera
Temora turbinata
Tortanus barbatus
Tortanus gracilis
Tortanus murrayi

5177. Lat. 13°35′ N., long. 120°54′36″ E.; Verde Island Passage, Philippine Islands; March 24, 1908; 25 fathoms; 1 species

Labidocera acuta

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5178. Lat. 12°43′ N., long. 122°06′15″ E.; vicinity Romblon Island, Philippine Islands; March 25, 1908; [surface, electric light]; 1 species

Eucalanus mucronatus

5179. Lat. 12°38′15″ N., long. 122°12′30″ E.; off Romblon Harbor, Philippine Islands; March 25, 1908; surface; 3 species

Eucalanus mucronatus
Labidocera acuta
Pleuromamma xiphias

5180. Lat. 12°28′30″ N., long. 122°15′ E.; off Romblon, Philippine Islands; March 26, 1908; surface; 47 species

Acartia danae
Acrocalanus gracilis
Calanopia elliptica
Calanopia minor
Candacia armata
Candacia bipinnata
Candacia bispinosa
Candacia norvegica
Candacia simplex
Candacia varicans
Canthocalanus pauper
Centropages furcatus
Corycaeus agilis
Corycaeus latus
Corycaeus longistylis
Corycaeus speciosus
Eucalanus attenuatus
Eucalanus crassus
Eucalanus elongatus
Eucalanus subcrassus
Eucalanus subtenuis
Euchirella intermedia
Labidocera acuta
Labidocera euchaeta
Macrosetella gracilis
Nannocalanus minor
Neocalanus gracilis
Oncaea venusta
Paracalanus parvus
Pleuromamma abdominalis
Pleuromamma gracilis
Pleuromamma xiphias
Pontellina plumata
Pseudocalanus minutus
Rhincalanus cornutus
Rhincalanus nasutus
Sapphirina auronitens
Sapphirina opalina
Scolecithricella auropecten
Scolecithrix danae
Temora discaudata
Temora longicornis
Temora stylifera
Temorites brevis
Undeuchaeta plumosa
Undinula caroli
Undinula vulgaris

5185. Lat. 10°05′45″ N., long. 122°18′30″ E.; between Panay and Negros, Philippine Islands; March 30, 1908; 550–0 fathoms; 146 species

Acartia danae
Acrocalanus gibber
Acrocalanus gracilis
Aegisthus mucronatus
Aegisthus spinulosus
Aetideus armatus
Amallophora typica
Amallothrix propinqua
Arietellus aculeatus
Arietellus plumifer
Arietellus simplex
Bradyidius armatus
Calanopia aurivillii
Calanopia elliptica
Calanopia minor
Candacia aethiopica
Candacia armata
Candacia bipinnata
Candacia bispinosa
Candacia longimana
Candacia norvegica
Candacia simplex
Canthocalanus pauper
Centraugaptilus horridus
Centraugaptilus rattrayi
Centropages furcatus
Chiridius armatus
Chiridius obtusifrons
Chirundina streetsi
Copilia mirabilis
Copilia quadrata
Cornucalanus chelifer
Corycaeus longistylis
Disseta palumboi
Euaetideus bradyi
Euaetideus giesbrechti
Euaugaptilus nodifrons
Euaugaptilus squamatus
Eucalanus attenuatus
Eucalanus crassus
Eucalanus elongatus
Eucalanus monachus
Eucalanus mucronatus
Eucalanus subcrassus
Eucalanus subtenuis
Euchaeta acuta
Euchaeta marina
Euchaeta media
Euchaeta pubera
Euchaeta spinosa
Euchirella curticauda
Euchirella galeata
Euchirella bitumida
Euchirella brevis
Euchirella intermedia
Euchirella messinensis
Euchirella pulchra
Farrania frigidus
Farranula gibbula
Gaetanus curvispinus
Gaetanus kruppii
Gaetanus latifrons
Gaetanus pileatus
Gaidius affinis
Haloptilus fons
Haloptilus longicornis

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5185. Lat. 10°05′45″ N., long. 122°18′30″ E.; between Panay and Negros; March 30, 1908; 550–0 fathoms; 146 species—Continued

Haloptilus ornatus
Hemirhabdus grimaldii
Heterorhabdus clausii
Heterorhabdus norvegicus
Heterorhabdus papilliger
Heterorhabdus robustus
Heterorhabdus spinifrons
Heterostylites longicornis
Heterostylites major
Labidocera minuta
Lophothrix frontalis
Lubbockia aculeata
Lubbockia squillimana
Lucicutia curta
Lucicutia flavicornis
Lucicutia grandis
Lucicutia longicornis
Lucicutia lucida
Lucicutia macrocera
Lucicutia tenuicauda
Megacalanus longicornis
Megacalanus princeps
Mesorhabdus angustus
Metridia longa
Metridia princeps
Mormonilla phasma
Nannocalanus minor
Neocalanus gracilis
Neocalanus tenuicornis
Oithona similis
Oncaea minuta
Oncaea venusta
Onchocalanus cristatus
Onchocalanus hirtipes
Onchocalanus steueri
Pachos punctatum
Paracalanus parvus
Pareuchaeta barbata
Pareuchaeta gracilis
Pareuchaeta hansenii
Pareuchaeta tonsa
Phaënna spinifera
Phyllopus aequalis
Phyllopus bidentatus
Phyllopus giesbrechti
Pleuromamma abdominalis
Pleuromamma gracilis
Pleuromamma piseki
Pleuromamma robusta
Pleuromamma xiphias
Pseudocalanus minutus
Rhincalanus cornutus
Rhincalanus nasutus
Sapphirina auronitens
Sapphirina metallina
Sapphirina nigromaculata
Sapphirina opalina
Sapphirina scarlata
Scaphocalanus affinis
Scaphocalanus angulifrons
Scaphocalanus brevicornis
Scaphocalanus magnus
Scolecithricella abyssalis
Scolecithricella auropecten
Scolecithricella bradyi
Scolecithricella dentata
Scolecithricella tydemanni
Scolecithrix danae
Scottocalanus persecans
Scottocalanus securifrons
Scottocalanus setosus
Scottocalanus thomasi
Temora discaudata
Temora longicornis
Temora stylifera
Undeuchaeta major
Undeuchaeta plumosa
Undinula caroli
Undinula darwinii
Undinula vulgaris

5186. Lat. 9°53′30″ N., long. 122°15′30″ E.; between Panay and Negros, Philippine Islands; March 30, 1908; surface; 61 species

Acartia negligens
Acrocalanus gibber
Acrocalanus gracilis
Calanopia americana
Calanopia elliptica
Calanopia minor
Calanopia thompsoni
Candacia bispinosa
Candacia norvegica
Candacia simplex
Canthocalanus pauper
Centropages furcatus
Copilia mirabilis
Corycaeus agilis
Corycaeus catus
Corycaeus latus
Corycaeus pumilus
Corycaeus speciosus
Eucalanus attenuatus
Eucalanus crassus
Eucalanus elongatus
Eucalanus monachus
Eucalanus mucronatus
Euchaeta acuta
Euchaeta marina
Euchaeta spinosa
Farranula concinna
Farranula gibbula
Gaetanus minor
Labidocera acuta
Labidocera acutifrons
Labidocera minuta
Lucicutia ovalis
Macrosetella gracilis
Metridia longa
Microsetella rosea
Nannocalanus minor
Neocalanus gracilis
Neocalanus tenuicornis
Oncaea minuta
Oncaea similis
Oncaea venusta
Phaënna spinifera
Pleuromamma abdominalis
Pleuromamma gracilis
Pleuromamma robusta
Pleuromamma xiphias
Pontellina plumata
Pontellopsis armata
Pseudocalanus minutus
Rhincalanus cornutus
Rhincalanus nasutus
Sapphirina auronitens
Sapphirina nigromaculata
Scolecithrix danae
Temora discaudata
Temora longicornis
Temora stylifera
Undeuchaeta plumosa
Undinula caroli
Undinula vulgaris

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5187. Lat. 9°16′45″ N., long. 123°21′15″ E.; off Negros, Philippine Islands; March 31, 1908; [between 225–0 fathoms; surface?]; 1 species

Eucalanus elongatus

5190. Lat. 10°08′15″ N., long. 123°16′45″ E.; east coast of Negros, Philippine Islands; April 1, 1908; 250–0 fathoms; 60 species

Acartia danae
Acrocalanus gibber
Acrocalanus gracilis
Bradyidius armatus
Calanopia elliptica
Candacia armata
Candacia pachydactyla
Candacia simplex
Canthocalanus pauper
Centropages furcatus
Copilia mirabilis
Copilia quadrata
Corycaeus agilis
Corycaeus latus
Corycaeus lautus
Corycaeus longistylis
Corycaeus speciosus
Euaetideus bradyi
Eucalanus attenuatus
Eucalanus elongatus
Eucalanus mucronatus
Euchaeta marina
Euchaeta spinosa
Euchirella intermedia
Euchirella pulchra
Haloptilus angusticeps
Haloptilus longicornis
Labidocera acuta
Lucicutia flavicornis
Lucicutia lucida
Metridia longa
Nannocalanus minor
Neocalanus gracilis
Oithona similis
Oncaea ornata
Oncaea similis
Oncaea venusta
Pachyptilus abbreviatus
Paracalanus parvus
Phaënna spinifera
Pleuromamma abdominalis
Pleuromamma gracilis
Pleuromamma xiphias
Pontellina plumata
Pseudocalanus minutus
Rhincalanus cornutus
Rhincalanus nasutus
Sapphirina angusta
Sapphirina auronitens
Sapphirina nigromaculata
Scolecithricella abyssalis
Scolecithricella auropecten
Scolecithricella bradyi
Scolecithrix danae
Temora discaudata
Temora longicornis
Temora stylifera
Undinula caroli
Undinula darwinii
Undinula vulgaris

5191. Lat. 10°29′45″ N., long. 123°31′15″ E.; Tanon Strait, Philippine Islands; April 2, 1908; surface; 3 species

Labidocera acuta
Nannocalanus minor
Undinula vulgaris

5196. Lat. 10°44′30″ N., long. 124°07′30″ E.; off northern Cebu, Philippine Islands; April 3, 1908; surface; 36 species

Acartia danae
Calanopia elliptica
Calanopia minor
Calocalanus pavo
Candacia armata
Candacia bispinosa
Candacia simplex
Canthocalanus pauper
Centropages calaninus
Centropages furcatus
Centropages gracilis
Corycaeus agilis
Corycaeus speciosus
Eucalanus elongatus
Euchaeta marina
Euchaeta spinosa
Euchirella intermedia
Farranula gibbula
Labidocera acuta
Metridia lucens
Nannocalanus minor
Neocalanus gracilis
Oncaea venusta
Pleuromamma abdominalis
Pleuromamma gracilis
Pleuromamma piseki
Pleuromamma robusta
Pleuromamma xiphias
Pontellina plumata
Sapphirina angusta
Sapphirina auronitens
Sapphirina nigromaculata
Sapphirina sali
Temora stylifera
Undinula caroli
Undinula vulgaris

5199. Lat. 9°31′50″ N., long. 124°40′ E.; off Pamilacan, western Bohol Island, Philippine Islands; surface; 2 species

Temora stylifera
Undinula darwinii

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5208. Lat. 11°45′53″ N., long. 124°42′50″ E.; off western Samar, Philippine Islands; April 14, 1908; surface; 23 species

Acartia danae
Acartia laxa
Acrocalanus gibber
Acrocalanus gracilis
Acrocalanus longicornis
Centropages furcatus
Chiridius armatus
Clausocalanus arcuicornis
Corycaeus latus
Corycaeus limbatus
Eucalanus attenuatus
Farranula carinata
Farranula gracilis
Labidocera minuta
Lucicutia curta
Macrosetella gracilis
Nannocalanus minor
Oithona similis
Oncaea venusta
Paracalanus parvus
Pseudocalanus minutus
Sapphirina ovato-lanceolata
Temora stylifera

5209. Lat. 11°45′25″ N., long. 124°48′05″ E.; off western Samar, Philippine Islands; April 14, 1908; surface; 18 species

Acartia danae
Acartia laxa
Acrocalanus longicornis
Canthocalanus pauper
Centropages furcatus
Corycaeus latus
Corycaeus speciosus
Eucalanus monachus
Farranula carinata
Farranula rostrata
Labidocera acuta
Neocalanus gracilis
Oithona linearis
Paracalanus parvus
Pseudocalanus minutus
Sapphirina angusta
Temora discaudata
Temora stylifera

5211. Lat. 11°51′35″ N., long. 124°14′ E.; east of Masbate, Philippine Islands; April 17, 1908; surface; 4 species

Labidocera acuta
Labidocera detruncata
Pseudocalanus minutus
Undinula vulgaris

5219. Lat. 13°21′ N., long. 122°18′45″ E.; Santa Cruz Harbor, Philippine Islands; April 23, 1908; surface; 2 species

Paracalanus parvus
Pseudocalanus minutus

5221. Lat. 13°38′15″ N., long. 121°48′15″ E.; between Marinduque and Luzón, Philippine Islands; April 24, 1908; [surface?]; 1 species

Scottocalanus securifrons

5223. Lat. 13°36′ N., long. 121°25′30″ E.; off Santa Cruz, Philippine Islands; April 24, 1908; surface; 69 species

Acartia danae
Acrocalanus gibber
Acrocalanus gracilis
Acrocalanus monachus
Amallothrix propinqua
Calanopia elliptica
Calanopia minor
Calanopia thompsoni
Caligus latifrons
Candacia aethiopica
Candacia bispinosa
Candacia norvegica
Candacia simplex
Candacia varicans
Centropages calaninus
Centropages furcatus
Copilia mirabilis
Copilia quadrata
Corycaeus agilis
Corycaeus latus
Corycaeus longistylis
Corycaeus speciosus
Corycaeus typicus
Eucalanus attenuatus
Eucalanus crassus
Eucalanus elongatus
Eucalanus mucronatus
Eucalanus subcrassus
Eucalanus subtenuis
Euchaeta marina
Farranula concinna
Farranula gibbula
Labidocera acuta
Labidocera minuta
Lucicutia ovalis
Macrosetella gracilis
Nannocalanus minor
Neocalanus tenuicornis
Oncaea similis
Oncaea venusta
Paracalanus parvus
Pleuromamma gracilis
Pleuromamma xiphias
Pontella atlantica
Pontella chierchiae

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5223. Lat. 13°36′ N., long. 121°25′30″ E.; off Santa Cruz, Philippine Islands; April 24, 1908; surface; 69 species—Continued

Pontella fera
Pontella gracilis
Pontellina plumata
Pontellopsis armata
Pontellopsis brevis
Pontellopsis globosa
Pontellopsis regalis
Pontellopsis sinuata
Pseudanthessius pacificus
Pseudocalanus minutus
Rhincalanus nasutus
Sapphirina auronitens
Sapphirina bicuspidata
Sapphirina metallina
Sapphirina nigromaculata
Sapphirina stellata
Scolecithricella dentata
Scolecithrix danae
Temora discaudata
Temora longicornis
Temora stylifera
Undeuchaeta major
Undinula caroli
Undinula vulgaris

5224. Lat. 13°34′50″ N., long. 121°21′45″ E.; Marinduque to Luzón, Philippine Islands; April 24, 1908; surface; 28 species

Candacia aethiopica
Candacia bipinnata
Candacia simplex
Centropages furcatus
Copilia mirabilis
Copilia vitrea
Eucalanus attenuatus
Eucalanus elongatus
Eucalanus subcrassus
Euchaeta acuta
Euchaeta marina
Euchaeta spinosa
Euchirella brevis
Euchirella intermedia
Euchirella messinensis
Gaidius brevispinus
Labidocera acuta
Nannocalanus minor
Neocalanus gracilis
Oithona similis
Oncaea notopa
Pareuchaeta incisa
Pleuromamma abdominalis
Pleuromamma gracilis
Pleuromamma xiphias
Sapphirina auronitens
Undinula caroli
Undinula vulgaris

5225. Lat. 14°13′24″ N., long. 120°32′36″ E.; off Corregidor, China Sea; May 4, 1908; 40–0 fathoms; 51 species

Acartia negligens
Acrocalanus gracilis
Calanopia elliptica
Calanopia minor
Candacia bipinnata
Candacia bispinosa
Candacia simplex
Canthocalanus pauper
Centropages furcatus
Copilia mirabilis
Copilia quadrata
Corycaeus agilis
Corycaeus latus
Corycaeus limbatus
Corycaeus pumilus
Corycaeus speciosus
Disseta palumboi
Euaugaptilus elongatus
Eucalanus attenuatus
Eucalanus crassus
Eucalanus elongatus
Eucalanus monachus
Eucalanus mucronatus
Eucalanus subcrassus
Eucalanus subtenuis
Euchaeta acuta
Euchaeta marina
Labidocera acuta
Labidocera minuta
Labidocera orsinii
Labidocera pavo
Nannocalanus minor
Neocalanus gracilis
Oithona similis
Oncaea minuta
Oncaea similis
Oncaea venusta
Pachos punctatum
Phaënna spinifera
Pseudocalanus minutus
Rhincalanus cornutus
Rhincalanus nasutus
Sapphirina auronitens
Sapphirina nigromaculata
Sapphirina opalina
Scolecithrix danae
Temora discaudata
Temora longicornis
Temora stylifera
Undinula caroli
Undinula vulgaris

5226. Lat. 14°12′15″ N., long. 120°32′24″ E.; off Corregidor, China Sea; May 4, 1908; surface; 33 species

Acartia danae
Acrocalanus gibber
Acrocalanus gracilis
Acrocalanus monachus
Aegisthus spinulosus
Aetideus armatus
Calanopia minor
Candacia simplex
Centropages furcatus
Centropages violaceus
Copilia mirabilis
Copilia quadrata
Corycaeus pumilus
Eucalanus attenuatus
Eucalanus crassus
Eucalanus mucronatus
Eucalanus subcrassus
Euchaeta marina

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5226. Lat. 14°12′15″ N., long. 120°32′24″ E.; off Corregidor, China Sea; May 4, 1908; surface; 33 species—Continued

Euchaeta spinosa
Farranula gibbula
Labidocera acuta
Oncaea minuta
Oncaea ornata
Paracalanus parvus
Pontella chierchiae
Pseudocalanus minutus
Scolecithrix danae
Spinocalanus magnus
Temora discaudata
Temora longicornis
Temora stylifera
Undinula caroli
Undinula vulgaris

5227. Lat. 12°53′45″ N., long. 121°52′30″ E.; east of Mindoro, Philippine Islands; May 5, 1908; 290–0 fathoms; 64 species

Acartia danae
Acrocalanus gracilis
Aegisthus spinulosus
Aetideus armatus
Augaptilus megalurus
Bradyidius similis
Candacia simplex
Centropages violaceus
Chiridius obtusifrons
Chirundina streetsi
Copilia mirabilis
Copilia quadrata
Corycaeus agilis
Corycaeus longistylis
Euaetideus giesbrechti
Eucalanus attenuatus
Eucalanus elongatus
Eucalanus monachus
Eucalanus mucronatus
Euchaeta acuta
Euchaeta marina
Euchaeta media
Euchaeta spinosa
Euchirella bitumida
Euchirella brevis
Euchirella curticauda
Euchirella galeata
Euchirella intermedia
Euchirella messinensis
Farranula rostrata
Gaetanus latifrons
Gaidius brevispinus
Gaidius tenuispinus
Haloptilus ornatus
Heterorhabdus papilliger
Lucicutia longicornis
Lucicutia tenuicauda
Macrosetella gracilis
Metridia longa
Metridia princeps
Oithona similis
Oncaea minuta
Paracalanus nanus
Paracalanus parvus
Pareuchaeta erebi
Pareuchaeta gracilis
Pleuromamma abdominalis
Pleuromamma gracilis
Pleuromamma piseki
Pleuromamma xiphias
Rhincalanus cornutus
Rhincalanus nasutus
Sapphirina angusta
Sapphirina auronitens
Sapphirina nigromaculata
Sapphirina opalina
Scolecithrix danae
Scottocalanus persecans
Scottocalanus securifrons
Scottocalanus thomasi
Temora longicornis
Undeuchaeta major
Undeuchaeta plumosa
Undinula vulgaris

5228. Lat. 12°29′30″ N., long. 122°15′45 E.; south of Romblon, Philippine Islands; May 5, 1908; surface; 37 species

Acrocalanus gibber
Acrocalanus gracilis
Calanopia elliptica
Calanopia minor
Candacia simplex
Canthocalanus pauper
Centropages furcatus
Copilia mirabilis
Dysgamus ariommus
Eucalanus attenuatus
Eucalanus bungii
Eucalanus crassus
Eucalanus elongatus
Eucalanus monachus
Euchaeta spinosa
Farranula gibbula
Labidocera acuta
Labidocera krøyeri
Labidocera minuta
Lucicutia flavicornis
Lucicutia longicornis
Metridia princeps
Nannocalanus minor
Oithona similis
Oncaea similis
Oncaea venusta
Pleuromamma xiphias
Pontellopsis armata
Pontellopsis villosus
Rhincalanus cornutus
Rhincalanus nasutus
Temora discaudata
Temora longicornis
Temora stylifera
Undeuchaeta major
Undinula caroli
Undinula vulgaris

5229. Lat. 10°48′45″ N., long. 124°21′15″ E.; between Cebu and Leyte, Philippine Islands; May 7, 1908; 150–0 fathoms; 27 species

Candacia simplex
Copilia mirabilis
Copilia quadrata
Corycaeus latus
Corycaeus longistylis
Corycaeus speciosus

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5229. Lat. 10°48′45″ N., long. 124°21′15″ E.; between Cebu and Leyte, Philippine Islands; May 7, 1908; 150–0 fathoms; 27 species—Continued

Eucalanus attenuatus
Eucalanus crassus
Eucalanus elongatus
Eucalanus mucronatus
Euchaeta marina
Euchaeta spinosa
Euchirella brevis
Labidocera acuta
Lucicutia flavicornis
Nannocalanus minor
Paracalanus nanus
Paracalanus parvus
Pareuchaeta incisa
Phaënna spinifera
Pleuromamma gracilis
Pleuromamma piseki
Pleuromamma xiphias
Rhincalanus nasutus
Sapphirina metallina
Scolecithricella auropecten
Undinula vulgaris

5230. Lat. 10°01′50″ N., long. 124°42′30″ E.; between Bohol and Leyte, Philippine Islands; May 7, 1908; surface; 24 species

Acartia danae
Acartia negligens
Acrocalanus gracilis
Calanopia elliptica
Calanopia minor
Candacia armata
Candacia simplex
Centropages furcatus
Copilia mirabilis
Corycaeus speciosus
Eucalanus subcrassus
Eucalanus subtenuis
Euchirella intermedia
Gaidius brevispinus
Labidocera acuta
Lucicutia flavicornis
Macrosetella gracilis
Neocalanus gracilis
Sapphirina salpae
Scaphocalanus medius
Scolecithricella dentata
Temora discaudata
Temora stylifera
Undinula vulgaris

5231. Lat. 10°01′15″ N., long. 124°43′15″ E.; between Bohol and Leyte, Philippine Islands; May 7, 1908; 80–0 fathoms; 84 species

Acartia danae
Acartia laxa
Acrocalanus gracilis
Amallothrix propinqua
Arietellus aculeatus
Calanopia elliptica
Calanopia minor
Candacia armata
Candacia simplex
Canthocalanus pauper
Centropages furcatus
Chiridius armatus
Chirundina streetsi
Clausocalanus arcuicornis
Corycaeus limbatus
Corycaeus speciosus
Disseta palumboi
Euaugaptilus nodifrons
Eucalanus attenuatus
Eucalanus bungii
Eucalanus elongatus
Eucalanus monachus
Eucalanus mucronatus
Eucalanus subcrassus
Euchaeta acuta
Euchaeta marina
Euchaeta pubera
Euchaeta spinosa
Euchirella brevis
Euchirella curticauda
Euchirella galeata
Euchirella pulchra
Farranula rostrata
Gaidius tenuispinus
Heterorhabdus papilliger
Heterorhabdus robustus
Heterorhabdus spinifrons
Labidocera acuta
Labidocera minuta
Lucicutia flavicornis
Lucicutia tenuicauda
Nannocalanus minor
Oithona similis
Oncaea conifera
Oncaea minuta
Oncaea venusta
Onchocalanus cristatus
Onchocalanus hirtipes
Paracalanus nanus
Paracalanus parvus
Paraugaptilus buchani
Pareuchaeta bradyi
Pareuchaeta gracilis
Pareuchaeta incisa
Pareuchaeta norvegica
Phaënna spinifera
Pleuromamma abdominalis
Pleuromamma gracilis
Pleuromamma robusta
Pleuromamma xiphias
Pontellina plumata
Pseudocalanus minutus
Rhincalanus nasutus
Sapphirina angusta
Sapphirina nigromaculata
Sapphirina opalina
Sapphirina ovatolanceolata
Scaphocalanus echinatus
Scaphocalanus insolitus
Scaphocalanus magnus
Scaphocalanus robustus
Scolecithricella abyssalis
Scolecithricella auropecten
Scottocalanus farrani
Scottocalanus helenae
Scottocalanus persecans
Scottocalanus securifrons
Scottocalanus setosus
Scottocalanus thomasi
Scottocalanus longispinus
Temora stylifera
Undeuchaeta major
Undeuchaeta plumosa
Undinula caroli

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5232. Lat. 10°00′45″ N., long. 124°44′06″ E.; between Bohol and Leyte, Philippine Islands; May 7, 1908; surface; 18 species

Acartia danae
Acrocalanus gibber
Calanopia elliptica
Calanopia minor
Candacia bispinosa
Centropages furcatus
Eucalanus attenuatus
Eucalanus pileatus
Eucalanus subtenuis
Euchirella bitumida
Labidocera acuta
Lucicutia longicornis
Paracalanus parvus
Pseudocalanus minutus
Sapphirina longifurca
Temora longicornis
Temora stylifera
Vettoria granulosa

5233. Lat. 10°00′22″ N., long. 124°45′06″ E.; between Bohol and Leyte, Philippine Islands; May 7, 1908; 100–0 fathoms; 65 species

Acartia danae
Acartia negligens
Acrocalanus gibber
Acrocalanus gracilis
Actideus armatus
Amallothrix gracilis
Amallothrix obtusifrons
Amallothrix propinqua
Calanopia aurivillii
Candacia bispinosa
Candacia simplex
Centropages furcatus
Clausocalanus furcatus
Eucalanus attenuatus
Eucalanus crassus
Eucalanus elongatus
Eucalanus monachus
Eucalanus mucronatus
Eucalanus subcrassus
Euchaeta acuta
Euchaeta marina
Euchaeta spinosa
Euchirella bitumida
Euchirella brevis
Euchirella curticauda
Euchirella galeata
Euchirella intermedia
Euchirella maxima
Farranula carinata
Gaidius brevispinus
Haloptilus angusticeps
Heterorhabdus norvegicus
Heterorhabdus papilliger
Heterorhabdus spinifrons
Lucicutia flavicornis
Lucicutia gemina
Lucicutia longicornis
Lucicutia lucida
Lucicutia tenuicauda
Neocalanus gracilis
Oncaea minuta
Oncaea venusta
Paracalanus parvus
Pareuchaeta incisa
Phaënna spinifera
Pleuromamma abdominalis
Pleuromamma gracilis
Pleuromamma robusta
Pleuromamma xiphias
Rhincalanus cornutus
Rhincalanus nasutus
Sapphirina nigromaculata
Sapphirina opalina
Scaphocalanus affinis
Scaphocalanus robustus
Scaphocalanus subbrevicornis
Scolecithricella auropecten
Scolecithricella bradyi
Scottocalanus longispinus
Scottocalanus thomasi
Temora stylifera
Undeuchaeta major
Undeuchaeta plumosa
Undinula darwinii
Valdiviella insignis

5234. Lat. 10°00′ N., long. 124°46′06″ E.; between Bohol and Leyte, Philippine Islands; May 7, 1908; 15–0 fathoms; 29 species

Acartia danae
Acartia longiremis
Acrocalanus gracilis
Anomalocera patersonii
Calanopia aurivillii
Candacia bipinnata
Copilia quadrata
Corycaeus agilis
Corycaeus latus
Eucalanus attenuatus
Eucalanus monachus
Farranula carinata
Heterorhabdus norvegicus
Microsetella rosea
Nannocalanus minor
Neocalanus gracilis
Neocalanus robustior
Oncaea minuta
Pleuromamma abdominalis
Pleuromamma gracilis
Pleuromamma piseki
Pontellopsis armata
Pseudocalanus minutus
Rhincalanus nasutus
Sapphirina angusta
Sapphirina auronitens
Temora stylifera
Undeuchaeta plumosa
Undinula caroli

5240. Lat. 6°49′36″ N., long. 126°15′ E.; Pujada Bay, Mindanao, Philippine Islands; May 14, 1908; 115–0 fathoms; 42 species

Acrocalanus gibber
Acrocalanus gracilis
Acrocalanus longicornis
Candacia simplex
Copilia mirabilis
Copilia quadrata

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5240. Lat. 6°49′36″ N., long. 126°15′ E.; Pujada Bay, Mindanao, Philippine Islands; May 14, 1908; 115–0 fathoms; 42 species—Continued

Corycaeus agilis
Corycaeus limbatus
Corycaeus longistylis
Corycaeus speciosus
Eucalanus attenuatus
Eucalanus elongatus
Euchaeta marina
Euchaeta spinosa
Farranula concinna
Haloptilus acutifrons
Haloptilus angusticeps
Haloptilus longicornis
Haloptilus ornatus
Haloptilus spiniceps
Lucicutia flavicornis
Lucicutia tenuicauda
Mecynocera clausi
Neocalanus gracilis
Oithona similis
Oncaea minuta
Oncaea ornata
Oncaea similis
Paracalanus parvus
Phaënna spinifera
Pleuromamma gracilis
Pontella fera
Rhincalanus cornutus
Sapphirina auronitens
Sapphirina stellata
Scolecithricella auro-pecten
Scolecithrix danae
Scottocalanus longispinus
Temora discaudata
Temora stylifera
Undinula caroli
Undinula vulgaris

5246. Lat. 6°29′15″ N., long. 126°18′45″ E.; east of Mindanao; May 15, 1908; 100–0 fathoms; 75 species

Acartia longiremis
Acrocalanus gracilis
Acrocalanus monachus
Augaptilus longicaudatus
Calanoides brevicornis
Calanopia elliptica
Calanopia minor
Calanus tonsus
Candacia simplex
Centropages gracilis
Centropages violaceus
Copilia denticulata
Copilia quadrata
Corycaeus flaccus
Corycaeus furcifer
Corycaeus limbatus
Corycaeus longistylis
Corycaeus speciosus
Corycaeus typicus
Euaetideus giesbrechti
Eucalanus attenuatus
Eucalanus mucronatus
Euchaeta acuta
Euchaeta marina
Euchaeta spinosa
Euchirella bitumida
Euchirella brevis
Euchirella curticauda
Euchirella galeata
Euchirella intermedia
Farranula carinata
Farranula gibbula
Gaetanus minor
Gaidius tenuispinus
Haloptilus bulliceps
Haloptilus longicornis
Haloptilus spiniceps
Heterorhabdus spinifrons
Lucicutia flavicornis
Lucicutia tenuicauda
Miracia efferata
Monacilla semispina
Monacilla typica
Nannocalanus minor
Neocalanus gracilis
Oithona linearis
Oithona similis
Oithona spinirostris
Oncaea conifera
Oncaea minuta
Oncaea venusta
Paracalanus parvus
Phaënna spinifera
Pleuromamma gracilis
Pleuromamma piseki
Pleuromamma quadrungulata
Pleuromamma robusta
Pleuromamma xiphias
Pontella fera
Pontellina plumata
Rhincalanus cornutus
Sapphirina nigromaculata
Scolecithricella auro-pecten
Scolecithricella dentata
Scolecithrix danae
Scottocalanus longispinus
Scottocalanus securifrons
Temora stylifera
Temora turbinata
Tortanus gracilis
Tortanus murrayi
Undeuchaeta major
Undeuchaeta plumosa
Undinula caroli
Undinula vulgaris

5247. Lat. 7°02′ N., long. 125°38′45″ E.; Gulf of Davao, Mindanao, Philippine Islands; May 18, 1908; surface; 1 species

Corycaeus speciosus

5258. Lat. 10°27′45″ N., long. 122°12′30″ E.; off southern Panay, Philippine Islands; June 2, 1908; surface; 3 species

Euchaeta marina
Undinula caroli
Undinula vulgaris

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5262. Lat. 12°37′30″ N., long. 121°37′30″ E., off eastern Mindoro, Philippine Islands; June 4, 1908; surface; 53 species

Acartia danae
Acartia negligens
Acrocalanus gibber
Acrocalanus gracilis
Acrocalanus longicornis
Acrocalanus monachus
Aegisthus mucronatus
Aegisthus spinulosus
Calanopia aurivillii
Calanopia elliptica
Candacia bispinosa
Candacia simplex
Centropages furcatus
Centropages krøyeri
Clausocalanus arcuicornis
Clytemnestra scutellata
Copilia quadrata
Corycaeus agilis
Corycaeus lautus
Corycaeus limbatus
Corycaeus longistylis
Corycaeus pumilus
Corycaeus speciosus
Eucalanus attenuatus
Eucalanus elongatus
Eucalanus monachus
Eucalanus subcrassus
Euchaeta hebes
Euchaeta marina
Farranula carinata
Farranula gibbula
Farranula rostrata
Labidocera acuta
Labidocera acutifrons
Labidocera detruncata
Labidocera minuta
Metridia longa
Microsetella norvegica
Nannocalanus minor
Oithona similis
Oncaea conifera
Oncaea minuta
Oncaea venusta
Paracalanus parvus
Pontella surrecta
Pontellina plumata
Pseudocalanus minutus
Temora discaudata
Temora longicornis
Temora stylifera
Temora turbinata
Undinula caroli
Undinula vulgaris

5263. Lat. 12°38′30″ N., long. 121°37′30″ E.; off eastern Mindoro, Philippine Islands; June 4, 1908; 65–0 fathoms; 75 species

Acartia negligens
Acrocalanus gibber
Amallothrix falcifer
Calanopia elliptica
Calanopia minor
Candacia longimana
Candacia simplex
Centropages furcatus
Clausocalanus arcuicornis
Copilia mirabilis
Copilia quadrata
Copilia vitrea
Corycaeus agilis
Corycaeus limbatus
Corycaeus ovalis
Corycaeus pumilus
Corycaeus speciosus
Eucalanus attenuatus
Eucalanus elongatus
Eucalanus monachus
Eucalanus mucronatus
Euchaeta marina
Euchaeta spinosa
Euchirella bitumida
Euchirella curticauda
Euchirella galeata
Euchirella intermedia
Euchirella messinensis
Farranula gibbula
Farranula rostrata
Heterorhabdus papilliger
Heterorhabdus spinifrons
Labidocera acuta
Lucicutia flavicornis
Lucicutia tenuicauda
Macrosetella gracilis
Metridia longa
Nannocalanus minor
Neocalanus gracilis
Oithona linearis
Oncaea conifera
Oncaea minuta
Paracalanus aculeatus
Paracalanus parvus
Pareuchaeta bisinuata
Pareuchaeta gracilis
Pareuchaeta incisa
Pareuchaeta tonsa
Phaënna spinifera
Pleuromamma abdominalis
Pleuromamma borealis
Pleuromamma gracilis
Pleuromamma piseki
Pleuromamma quadrungulata
Pleuromamma xiphias
Pseudocalanus minutus
Ratania flava
Rhincalanus cornutus
Sapphirina angusta
Sapphirina auronitens
Sapphirina nigromaculata
Sapphirina salpae
Sapphirina scarlata
Scaphocalanus echinatus
Scolecithricella abyssalis
Scolecithricella auropecten
Scolecithricella bradyi
Scolecithrix danae
Scottocalanus persecans
Temora discaudata
Temora longicornis
Temora stylifera
Undeuchaeta major
Undeuchaeta plumosa
Undinula vulgaris

5267. Lat. 13°42′20″ N., long. 120°58′25″ E.; Verde Island Passage, Philippine Islands; June 8, 1908; surface; 1 species

Labidocera minuta

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5281. Lat. 13°52′45″ N., long. 120°25′ E.; off southern Luzón, Philippine Islands; July 18, 1908; surface; 1 species

Canthocalanus pauper

5284. Lat. 13°42′05″ N., long. 120°30′45″ E.; off southern Luzón, Philippine Islands; July 20, 1908; surface; 1 species

Neocalanus robustior

5285. Lat. 13°39′36″ N., long. 120°32′55″ E.; off southern Luzón, Philippine Islands; July 20, 1908; surface; 1 species

Chiridius armatus

5287. Lat. 13°37′40″ N., long. 120°39′ E.; off southern Luzón, Philippine Islands; July 20, 1908; 310–0 fathoms; 36 species

Amallothrix emarginata
Arietellus simplex
Centraugaptilus horridus
Euaugaptilus laticeps
Eucalanus attenuatus
Eucalanus elongatus
Eucalanus mucronatus
Euchirella bitumida
Euchirella curticauda
Euchirella intermedia
Euchirella rostrata
Gaetanus curvispinus
Gaetanus kruppii
Gaetanus latifrons
Gaetanus pileatus
Haloptilus ornatus
Lophothrix frontalis
Lucicutia longicornis
Megacalanus longicornis
Metridia atra
Metridia longa
Metridia princeps
Pareuchaeta incisa
Pareuchaeta sarsi
Pareuchaeta scotti
Pareuchaeta tumidula
Pennella (immature)
Pleuromamma xiphias
Rhincalanus cornutus
Rhincalanus nasutus
Sapphirina auronitens
Scottocalanus longispinus
Scottocalanus persecans
Scottocalanus securifrons
Tortanus forcipatus
Undeuchaeta major

5292. Lat 13°28′45″ N., long. 121°01′12″ E.; off southern Luzón, Philippine Islands; July 23, 1901 [surface?]; 1 species

Lucicutia longicornis

5296. Lat. 13°40′09″ N., long. 120°57′45″ E.; off southern Luzón, Philippine Islands; July 24, 1908; surface; 4 species

Euchirella bitumida
Farranula carinata
Gaetanus minor
Oncaea conifera

5299. Lat. 20°05′ N., long. 116°05′ E.; off southern Luzón, Philippine Islands; August 8, 1908; surface; 15 species

Centropages furcatus
Eucalanus monachus
Farranula gibbula
Farranula rostrata
Labidocera acuta
Labidocera detruncata
Labidocera minuta
Nannocalanus minor
Neocalanus gracilis
Oncaea minuta
Paracalanus parvus
Pontella fera
Pontella valida
Pontellopsis bitumida
Temora stylifera

†5301. Lat. 20°37′ N., long. 115°43′ E.; China Sea, off Hong Kong; August 8, 1908; surface; 31 species

Acartia negligens
Acrocalanus gibber
Acrocalanus gracilis
Arietellus tripartitus
Calocalanus pavo
Candacia simplex
Clytemnestra scutellata
Copilia denticulata
Corycaeus limbatus
Corycaeus longistylis
Eucalanus monachus
Eucalanus subtenuis

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†5301. Lat. 20°37′ N., long. 115°43′ E.; China Sea, off Hong Kong; August 8, 1908; surface; 31 species—Continued

Farranula carinata
Farranula curta
Farranula gibbula
Farranula gracilis
Labidocera minuta
Lucicutia lucida
Macrosetella gracilis
Metridia longa
Nannocalanus minor
Neocalanus robustior
Oculosetella gracilis
Oncaea venusta
Paracalanus parvus
Pseudocalanus minutus
Sapphirina auronitens
Temora discaudata
Temora longicornis
Temora stylifera
Tortanus murrayi

5308. Lat. 21°54′ N., long. 115°42′ E.; China Sea, off Hong Kong; November 4, 1908; 62–0 fathoms; 9 species

Calanopia aurivillii
Candacia aethiopica
Corycaeus longistylis
Euchaeta marina
Macrosetella gracilis
Oncaea minuta
Oncaea venusta
Sapphirina auronitens
Undinula caroli

5309. Lat. 21°53′ N., long. 115°51′ E.; China Sea, off Hong Kong; 62–0 fathoms; 9 species

Candacia norvegica
Farranula rostrata
Gaidius brevispinus
Nannocalanus minor
Oithona similis
Oncaea minuta
Paracalanus parvus
Pseudocalanus minutus
Undinula vulgaris

5310. Lat. 21°33′ N., long. 116°13′ E.; China Sea, off Hong Kong; November 4, 1908; [surface?]; 1 species

Farranula rostrata

†5312. Lat. 21°30′ N., long. 116°32′ E.; China Sea, near Hong Kong; November 4, 1908; surface; 9 species

Acartia danae
Acrocalanus gracilis
Farranula rostrata
Gaidius brevispinus
Labidocera acuta
Macrosetella gracilis
Neocalanus gracilis
Oncaea minuta
Oncaea venusta

5319. Lat. 21°31′ N., long. 117°53′ E.; China Sea, near Formosa; November 5, 1908; 20–0 fathoms; 54 species

Acartia danae
Arietellus armatus
Calanopia elliptica
Candacia simplex
Candacia turgida
Centropages calaninus
Centropages furcatus
Copilia mirabilis
Corycaeus agilis
Corycaeus lautus
Corycaeus longistylis
Corycaeus speciosus
Eucalanus attenuatus
Eucalanus crassus
Eucalanus elongatus
Euchaeta marina
Euchirella intermedia
Euchirella messinensis
Farranula concinna
Haloptilus mucronatus
Labidocera acuta
Labidocera detruncata
Labidocera minuta
Lucicutia curta
Lucicutia longiserrata
Nannocalanus minor
Neocalanus gracilis
Oithona similis
Oncaea ornata
Oncaea venusta
Paracalanus parvus
Pareuchaeta gracilis
Pareuchaeta incisa
Pareuchaeta tumidula
Phaënna spinifera
Pleuromamma abdominalis
Pontella danae
Pontellina plumata
Pontellopsis strenua
Sapphirina angusta
Sapphirina auronitens
Sapphirina nigromaculata
Sapphirina opalina
Sapphirina stellata
Scolecithricella bradyi
Scolecithrix danae
Stephos perplexus
Temora discaudata
Temora longicornis
Temora stylifera
Undeuchaeta major
Undeuchaeta plumosa
Undinula caroli
Undinula vulgaris

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†5320. Lat. 20°58′ N., long. 120°03′ E.; China Sea, off Formosa; November 9, 1908; 500–0 fathoms; 90 species

Acartia longiremis
Acrocalanus gibber
Acrocalanus gracilis
Acrocalanus monachus
Aegisthus mucronatus
Bathypontia minor
Calanoides brevicornis
Calanopia elliptica
Calanopia minor
Candacia simplex
Centropages furcatus
Chiridiella macrodactyla
Clausocalanus arcuicornis
Conaea gracilis
Copilia denticulata
Copilia mirabilis
Copilia quadrata
Corycaeus agilis
Corycaeus lautus
Corycaeus limbatus
Corycaeus longistylis
Corycaeus ovalis
Corycaeus pumilus
Corycaeus speciosus
Corycaeus typicus
Cymbasoma rigidum
Disseta maxima
Disseta palumboi
Euaetideus bradyi
Euaugaptilus angustus
Eucalanus attenuatus
Eucalanus elongatus
Euchaeta marina
Euchaeta spinosa
Euchirella galeata
Euchirella messinensis
Farranula carinata
Farranula curta
Farranula gibbula
Farranula rostrata
Gaidius tenuispinus
Haloptilus longicornis
Haloptilus ornatus
Heterorhabdus papilliger
Heterorhabdus spinifrons
Lubbockia squillimana
Lucicutia atlantica
Lucicutia clausii
Lucicutia flavicornis
Lucicutia lucida
Macrosetella gracilis
Mecynocera clausi
Megacalanus longicornis
Metridia macrura
Metridia venusta
Microsetella norvegica
Microsetella rosea
Nannocalanus minor
Neocalanus gracilis
Neocalanus tenuicornis
Oculosetella gracilis
Oithona linearis
Oithona similis
Oncaea conifera
Oncaea minuta
Oncaea venusta
Onchocalanus trigoniceps
Paracalanus parvus
Pareuchaeta gracilis
Phaënna spinifera
Phyllopus helgae
Pleuromamma piseki
Pleuromamma robusta
Pleuromamma xiphias
Pontellina plumata
Pseudocalanus minutus
Pseudochirella scopularis
Rhincalanus cornutus
Sapphirina nigromaculata
Scaphocalanus magnus
Scolecithricella abyssalis
Scolecithricella auropecten
Scolecithricella dentata
Scolecithrix danae
Temora discaudata
Temora stylifera
Undinula caroli
Undinula darwinii
Undinula vulgaris

5321. Lat. 20°19′30″ N., long. 121°51′15″ E.; China Sea, off Hong Kong; November 9, 1908; 26–0 fathoms; 1 species

Scolecocalanus spinifer

5334. Lat. 12°25′40″ N., long. 120°38′ E.; Mindoro Strait, Philippine Islands; surface; 10 species

Candacia simplex
Centropages furcatus
Corycaeus longistylis
Corycaeus ovalis
Corycaeus speciosus
Farranula rostrata
Macrosetella gracilis
Miracia efferata
Pontellina plumata
Sapphirina auronitens

†5338. Lat. 11°33′45″ N., long. 119°24′45″ E.; Palawan Passage, Philippine Islands; December 20, 1908; 10 feet to surface; 27 species

Acartia negligens
Calanopia elliptica
Calanopia minor
Centropages furcatus
Corycaeus agilis
Corycaeus longistylis
Corycaeus ovalis
Corycaeus speciosus
Eucalanus attenuatus
Eucalanus monachus
Euchaeta marina
Farranula carinata
Farranula gibbula
Labidocera acutifrons
Microsetella rosea

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†5338. Lat. 11°33′45″ N., long. 119°24′45″ E.; Palawan Passage, Philippine Islands; December 20, 1908; 10 feet to surface; 27 species—Continued

Nannocalanus minor
Neocalanus gracilis
Oithona spinirostris
Oncaea minuta
Oncaea venusta
Paracalanus parvus
Pontellina plumata
Pseudocalanus minutus
Sapphirina auronitens
Temora discaudata
Temora stylifera
Undinula vulgaris

5340. Lat. 10°55′51″ N., long. 119°14′12″ E.; Malampaya Sound, Palawan, Philippine Islands; December 22, 1908; 17–22 fathoms; 58 species

Acartia danae
Acartia longiremis
Acartia negligens
Acrocalanus gibber
Acrocalanus gracilis
Acrocalanus longicornis
Calanopia aurivillii
Calanopia elliptica
Calanopia minor
Candacia aethiopica
Candacia norvegica
Candacia simplex
Canthocalanus pauper
Centropages furcatus
Centropages krøyeri
Centropages typicus
Centropages violaceus
Clausocalanus arcuicornis
Clausocalanus furcatus
Copilia quadrata
Corycaeus catus
Corycaeus longistylis
Corycaeus pacificus
Corycaeus pumilus
Eucalanus monachus
Euchaeta acuta
Euchaeta marina
Farranula carinata
Farranula gibbula
Farranula rostrata
Gaidius brevispinus
Labidocera acuta
Labidocera acutifrons
Labidocera minuta
Macrosetella gracilis
Microsetella rosea
Nannocalanus minor
Neocalanus gracilis
Neocalanus robustior
Neocalanus tenuicornis
Oithona similis
Oncaea minuta
Oncaea venusta
Paracalanus parvus
Phaënna spinifera
Pontellopsis armata
Pontellopsis laminata
Pontellopsis perspicax
Pontellopsis strenua
Pseudocalanus minutus
Scolecithricella dentata
Scolecithrix danae
Temora discaudata
Temora stylifera
Tortanus gracilis
Tortanus murrayi
Undinula caroli
Undinula vulgaris

5341. Lat. 10°57′51″ N., long. 119°17′26″ E.; off Palawan, Philippine Islands; December 23, 1908; surface; 2 species

Paracalanus parvus
Pseudocalanus minutus

5342. Lat. 10°56′55″ N., long. 119°17′24″ E., off Palawan, Philippine Islands; December 23, 1908; surface; 14 species

Acartia danae
Acrocalanus gracilis
Calanopia thompsoni
Candacia simplex
Eucalanus attenuatus
Euchaeta marina
Labidocera acuta
Labidocera krøyeri
Neocalanus gracilis
Paracalanus parvus
Pseudocalanus minutus
Scolecithricella bradyi
Temora stylifera
Undinula vulgaris

5346. Lat. 10°50′30″ N., long. 119°22′20″ E.; off Palawan, Philippine Islands; December 26, 1908; surface; 2 species

Acrocalanus gracilis
Scolecithrix danae

†5348. Lat. 10°57′45″ N., long. 118°38′15″ E.; off Palawan, Philippine Islands; December 27, 1908; surface; 28 species

Acartia danae
Acrocalanus gracilis
Acrocalanus longicornis
Calanopia elliptica
Calanopia minor
Corycaeus agilis
Corycaeus longistylis
Corycaeus pacificus
Corycaeus speciosus

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†5348. Lat. 10°57′45″ N., long. 11°38′15″ E.; off Palawan, Philippine Islands; December 27, 1908; surface; 28 species—Continued

Eucalanus elongatus
Eucalanus monachus
Euchaeta marina
Farranula carinata
Farranula concinna
Farranula gibbula
Labidocera acuta
Microsetella rosea
Oithona linearis
Oithona similis
Oncaea minuta
Oncaea venusta
Paracalanus parvus
Pontellopsis brevis
Sapphirina angusta
Sapphirina nigromaculata
Sapphirina opalina
Temora discaudata
Undinula vulgaris

5349. Lat. 10°54′ N., long. 118°26′20″ E.; off Palawan, Philippine Islands; December 27, 1908; surface; 10 species

Acartia negligens
Acrocalanus gracilis
Corycaeus agilis
Corycaeus lautus
Farranula gibbula
Macrosetella gracilis
Oncaea minuta
Paracalanus parvus
Pseudocalanus minutus
Undinula vulgaris

5357. Lat. 8°06′ N., long. 117°17′10″ E.; Balabac Strait, Philippine Islands; January 5, 1909; surface; 1 species

Corycaeus crassiusculus

†5358. Lat. 6°06′40″ N., long. 118°18′15″ E.; Jolo Sea, Philippine Islands; January 7, 1909; surface; 9 species

Candacia simplex
Eucalanus monachus
Euchaeta marina
Labidocera acutifrons
Macrosetella gracilis
Paracalanus parvus
Rhincalanus cornutus
Temora stylifera
Undinula vulgaris

5381. Lat. 13°14′15″ N., long. 122°44′45″ E.; Ragay Gulf, Luzón, Philippine Islands; March 6, 1909; 88–0 fathoms; 3 species

Paracalanus parvus
Pseudocalanus minutus
Temora longicornis

5382. Lat. 13°15′20″ N., long. 122°45′30″ E.; Ragay Gulf, Luzón, Philippine Islands; March 6, 1909; 10 feet to surface; 24 species

Acrocalanus gibber
Acrocalanus gracilis
Candacia aethiopica
Candacia simplex
Centropages furcatus
Chiridius gracilis
Corycaeus agilis
Corycaeus ovalis
Corycaeus speciosus
Farranula carinata
Farranula gibbula
Farranula rostrata
Gaidius brevispinus
Labidocera acuta
Nannocalanus minor
Neocalanus gracilis
Oncaea minuta
Oncaea venusta
Paroithona parvula
Pontellina plumata
Pontellopsis armata
Temora longicornis
Temora stylifera
Undinula vulgaris

†5386. Lat. 15°38′30″ N., long. 122°44′30″ E.; March 9, 1909; 10 feet to surface; 33 species

Acartia danae
Acrocalanus gibber
Acrocalanus gracilis
Acrocalanus monachus
Centropages furcatus
Corycaeus agilis
Corycaeus latus
Corycaeus ovalis
Corycaeus speciosus
Eucalanus bungii
Eucalanus elongatus
Eucalanus mucronatus
Farranula carinata
Farranula concinna
Farranula gibbula
Farranula rostrata
Labidocera acuta
Labidocera minuta

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†5386. Lat. 15°38′30″ N., long. 122°44′30″ E.; March 9, 1909; 10 feet to surface; 33 species—Continued

Macrosetella gracilis
Microsetella rosea
Miracia efferata
Nannocalanus minor
Neocalanus gracilis
Neocalanus robustior
Oncaea minuta
Oncaea venusta
Paracalanus parvus
Sapphirina auronitens
Sapphirina salpae
Temora stylifera
Undinula caroli
Undinula darwinii
Undinula vulgaris

5387. Lat. 12°54′40″ N., long. 123°20′30″ E.; between Burias and Luzón, Philippine Islands; March 11, 1909; surface; 14 species

Acrocalanus gibber
Acrocalanus gracilis
Calanopia minor
Candacia aethiopica
Centropages furcatus
Corycaeus agilis
Corycaeus speciosus
Farranula carinata
Farranula gibbula
Oithona similis
Oncaea minuta
Paracalanus parvus
Undinula darwinii
Undinula vulgaris

†5388. Lat. 12°51′50″ N., long. 123°26′15″ E.; March 11, 1909; 15 feet to surface; 5 species

Corycaeus agilis
Corycaeus latus
Corycaeus pumilus
Farranula concinna
Nannocalanus minor

5395. Lat. 11°56′40″ N., long. 124°14′ E.; between Samar and Masbate, Philippine Islands; March 15, 1909; surface; 1 species

Acrocalanus gracilis

5396. Lat. 11°57′ N., long. 124°12′24″ E.; between Samar and Masbate, Philippine Islands; March 15, 1909; surface; 7 species

Clausocalanus arcuicornis
Eucalanus attenuatus
Euchaeta marina
Euchaeta spinosa
Nannocalanus minor
Undinula caroli
Undinula vulgaris

5397. Lat. 11°57′27″ N., long. 124°10′42″ E.; between Samar and Masbate, Philippine Islands; March 15, 1909; surface; 11 species

Corycaeus agilis
Eucalanus monachus
Eucalanus mucronatus
Euchaeta marina
Euchaeta spinosa
Nannocalanus minor
Neocalanus gracilis
Oncaea minuta
Paracalanus parvus
Undinula caroli
Undinula vulgaris

5399. Lat. 11°21′45″ N., long. 124°05′ E.; north of Cebu, Philippine Islands; March 16, 1909; surface; 30 species

Acartia danae
Acartia longiremis
Acrocalanus gibber
Acrocalanus gracilis
Acrocalanus monachus
Calocalanus pavo
Candacia armata
Candacia simplex
Centropages furcatus
Clausocalanus furcatus
Clytemnestra scutellata
Corycaeus latus
Corycaeus pacificus
Eucalanus attenuatus
Farranula carinata
Farranula gibbula
Farranula rostrata
Macrosetella gracilis
Microsetella rosea
Neocalanus robustior
Neocalanus tenuicornis
Oithona linearis
Oncaea minuta
Oncaea venusta
Paracalanus aculeatus
Pseudocalanus minutus
Scolecithricella bradyi
Temora discaudata
Temora stylifera
Undinula caroli

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5404. Lat. 10°50′ N., long. 124°26′18″ E.; Dupon Bay, Leyte, Philippine Islands; March 17, 1909; surface; 1 species

Eucalanus monachus

5410. Lat. 10°28′45″ N., long. 124°05′30″ E.; between Cebu and Leyte, Philippine Islands; March 18, 1909; surface; 8 species

Acartia negligens	Oncaea minuta	Tortanus gracilis
Acrocalanus gracilis	Paracalanus parvus	Tortanus murrayi
Nannocalanus minor	Scolecithrix danae	

5411. Lat. 10°10′30″ N., long. 123°51′15″ E.; between Cebu and Bohol, Philippine Islands; March 23, 1909; surface; 8 species

Acartia negligens	Oncaea minuta	Tortanus gracilis
Acrocalanus gracilis	Paracalanus parvus	Tortanus murrayi
Nannocalanus minor	Scolecithrix danae	

5412. Lat. 10°09′15″ N., long. 123°52′ E.; between Cebu and Bohol, Philippine Islands; March 23, 1909; surface; 10 species

Acrocalanus gibber	Oncaea venusta	Undinula caroli
Candacia armata	Paracalanus aculeatus	Undinula vulgaris
Candacia simplex	Pseudocalanus minutus	
Corycaeus lautus	Scolecithricella bradyi	

†5413. Lat. 10°10′35″ N., long. 124°03′15″ E.; between Cebu and Bohol, Philippine Islands; March 24, 1909; 15 feet to surface; 1 species

Acrocalanus gibber

5414. Lat. 10°10′40″ N., long. 124°02′45″ E.; between Cebu and Bohol, Philippine Islands; March 24, 1909; surface; 6 species

Candacia simplex	Macrosetella gracilis	Neocalanus gracilis
Eucalanus monachus	Nannocalanus minor	Pseudocalanus minutus

5415. Lat. 10°07′50″ N., long. 123°57′ E.; between Cebu and Bohol, Philippine Islands; March 24, 1909; 88–0 fathoms; 38 species

Acartia danae	Farranula gibbula	Pontella fera
Acartia longiremis	Farranula rostrata	Pontella tenuiremis
Acrocalanus gracilis	Labidocera acuta	Pontellina plumata
Acrocalanus longicornis	Labidocera euchaeta	Pseudocalanus minutus
Calanopia aurivillii	Labidocera tenuicauda	Sapphirina angusta
Candacia simplex	Lucicutia longicornis	Sapphirina auronitens
Centropages furcatus	Nannocalanus minor	Scolecithricella bradyi
Copilia quadrata	Neocalanus gracilis	Scolecithrix danae
Corycaeus longistylis	Neocalanus tenuicornis	Temora longicornis
Corycaeus ovalis	Oithona similis	Tortanus recticauda
Corycaeus speciosus	Oncaea minuta	Undinula caroli
Eucalanus attenuatus	Oncaea venusta	Undinula vulgaris
Eucalanus monachus	Paracalanus parvus	

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†5422. Lat. 10°31′ N., long. 122°18′45″ E.; between Panay and Guimaras, Philippine Islands; March 30, 1909; surface; 42 species

Acartia danae
Acrocalanus gracilis
Calanopia elliptica
Candacia simplex
Candacia turgida
Canthocalanus pauper
Copilia mirabilis
Copilia quadrata
Corycaeus agilis
Corycaeus catus
Corycaeus speciosus
Eucalanus attenuatus
Eucalanus crassus
Eucalanus elongatus
Eucalanus mucronatus
Euchaeta acuta
Euchaeta marina
Euchaeta spinosa
Euchirella brevis
Farranula gibbula
Haloptilus spiniceps
Heterorhabdus papilliger
Labidocera minuta
Lubbockia squillimana
Lucicutia flavicornis
Macrosetella gracilis
Metridia longa
Neocalanus gracilis
Neocalanus robustior
Neocalanus tenuicornis
Pleuromamma abdominalis
Pleuromamma gracilis
Pleuromamma xiphias
Pontellopsis armata
Rhincalanus cornutus
Sapphirina angusta
Sapphirina metallina
Scolecithricella bradyi
Scolecithrix danae
Temora stylifera
Undinula caroli
Undinula vulgaris

5423. Lat. 9°38′30″ N., long. 121°11′ E.; Jolo Sea, Philippine Islands; March 31, 1909; [between 508–0 fathoms; surface ?]; 2 species

Paracalanus parvus
Pseudocalanus minutus

5424. Lat. 9°37′05″ N., long. 121°12′37″ E.; Jolo Sea, Philippine Islands; March 31, 1909; between 340–0 fathoms; 26 species

Acrocalanus gibber
Acrocalanus longicornis
Candacia simplex
Centropages furcatus
Centropages violaceus
Clausocalanus arcuicornis
Corycaeus agilis
Corycaeus catus
Corycaeus limbatus
Corycaeus longistylis
Corycaeus ovalis
Corycaeus pumilus
Eucalanus attenuatus
Farranula rostrata
Macrosetella gracilis
Nannocalanus minor
Oncaea conifera
Paracalanus parvus
Pleuromamma gracilis
Pseudocalanus minutus
Sapphirina auronitens
Sapphirina nigromaculata
Temora discaudata
Temora longicornis
Temora stylifera
Undinula vulgaris

5425. Lat. 9°37′45′ N., long. 121°11′ E. Jolo Sea, Philippine Islands; March 31, 1909; [surface?]; 1 species

Corycaeus catus

5430. Lat. 9°49′40″ N., long. 119°03′20″ E.; vicinity eastern Palawan, Philippine Islands; April 6, 1909; surface; 9 species

Candacia norvegica
Corycaeus agilis
Farranula gibbula
Farranula rostrata
Macrosetella gracilis
Microsetella norvegica
Microsetella rosea
Oncaea minuta
Scolecithrix danae

5431. Lat. 10°38′45″ N., long. 120°12′45″ E.; vicinity eastern Palawan, Philippine Islands; April 8, 1909; [surface?]; 1 species

Macrosetella gracilis

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5434. Lat. 10°46′45″ N., long. 120°22′45″ E.; vicinity eastern Palawan, Philippine Islands; April 8, 1909; surface; 26 species

Acrocalanus gibber
Acrocalanus gracilis
Calanopia elliptica
Calanopia minor
Candacia bispinosa
Candacia simplex
Centropages furcatus
Corycaeus latus
Corycaeus limbatus
Corycaeus longistylis
Corycaeus speciosus
Eucalanus attenuatus
Eucalanus elongatus
Euchaeta marina
Farranula carinata
Labidocera acuta
Oncaea similis
Oncaea venusta
Pleuromamma gracilis
Pseudocalanus minutus
Sapphirina auronitens
Temora discaudata
Temora longicornis
Temora stylifera
Undinula caroli
Undinula vulgaris

5436. Lat. 14°22′37″ N., long. 120°29′ E.; west of Luzón, Philippine Islands; May 7, 1909; surface; 3 species

Copilia mirabilis
Eucalanus monachus
Eucalanus mucronatus

5437. Lat. 15°45′54″ N., long. 119°42′45″ E.; west coast of Luzón, Philippine Islands; May 8, 1909; 600–0 fathoms; 82 species

Acartia danae
Acrocalanus gibber
Acrocalanus gracilis
Acrocalanus longicornis
Acrocalanus monachus
Aegisthus spinulosus
Aetideus armatus
Amallothrix falcifer
Candacia simplex
Centropages furcatus
Centropages violaceus
Clausocalanus arcuicornis
Copilia mirabilis
Corycaeus agilis
Corycaeus flaccus
Corycaeus latus
Corycaeus lautus
Corycaeus longistylis
Corycaeus lubbockii
Corycaeus ovalis
Disseta maxima
Eucalanus attenuatus
Eucalanus elongatus
Euchaeta marina
Euchirella messinensis
Euchirella rostrata
Farranula carinata
Farranula gibbula
Farranula rostrata
Gaetanus latifrons
Haloptilus longicornis
Haloptilus ornatus
Heterorhabdus papilliger
Heterorhabdus spinifrons
?Lubbockia brevis
Lubbockia squillimana
Lucicutia atlantica
Lucicutia flavicornis
Lucicutia ovalis
Lucicutia simulans
Lucicutia tenuicauda
Macrosetella gracilis
Mecynocera clausi
Megacalanus princeps
Metridia venusta
Microsetella norvegica
Microsetella rosea
Miracia efferata
Monacilla typica
Mormonilla phasma
Nannocalanus minor
Neocalanus gracilis
Neocalanus robustior
Neocalanus tenuicornis
Oithona linearis
Oithona similis
Oithona spinirostris
Oncaea conifera
Oncaea minuta
Oncaea venusta
Paracalanus aculeatus
Paracalanus parvus
Paroithona parvula
Phaënna spinifera
Phyllopus aequalis
Pleuromamma abdominalis
Pleuromamma gracilis
Pleuromamma quadrungulata
Pleuromamma robusta
Pleuromamma xiphias
Pseudocalanus minutus
Rhincalanus cornutus
Sapphirina auronitens
Sapphirina nigromaculata
Scolecithricella auropecten
Scolecithricella bradyi
Scottocalanus setosus
Scottocalanus thomasi
Temora longicornis
Undeuchaeta major
Undeuchaeta plumosa
Undinula caroli

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5451. Lat. 13°22'22" N., long. 124°00'48" E.; off Bataan, Philippine Islands; June 5, 1909; 280–0 fathoms; 16 species

Arietellus armatus
Arietellus setosus
Euaugaptilus hecticus
Eucalanus attenuatus
Euchaeta marina
Euchaeta spinosa
Lophothrix frontalis
Lophothrix humilifrons
Lucicutia tenuicauda
Pleuromamma abdominalis
Pleuromamma gracilis
Pleuromamma xiphias
Rhincalanus cornutus
Scottocalanus thomasi
Undeuchaeta major
Undeuchaeta plumosa

5456. Lat. 13°11'10" N., long. 123°51'52" E.; east coast Luzón, Philippine Islands; June 7, 1909; 120 fathoms; 1 species

Sapphirina opalina

5457. Lat. 13°12' N., long. 123°49'40" E.; off Bataan, Philippine Islands; June 8, 1909; 146–0 fathoms; 1 species

Arietellus giesbrechti

5460. Lat. 13°32'30" N., long. 123°58'06" E.; off eastern Luzón, Philippine Islands; June 10, 1909; [surface?]; 4 species

Acartia danae
Caligus latifrons
Labidocera acutifrons
Pontella valida

5484. Lat. 10°28' N., long. 125°20' E.; between Samar and Leyte, Philippine Islands; July 30, 1909; 76–0 fathoms; 1 species

Corycaeus speciosus

5488. Lat. 10°00' N., long. 125°06'45" E.; between Leyte and Mindanao, Philippine Islands; July 31, 1909; 10–0 feet; 10 species

Acrocalanus monachus
Copilia quadrata
Eucalanus monachus
Labidocera acuta
Macrosetella gracilis
Oncaea minuta
Sapphirina salpae
Sapphirina scarlata
Temora longicornis
Temora stylifera

†5489. Lat. 9°50'30" N., long. 125°10' E.; between Leyte and Mindanao, Philippine Islands; July 31, 1909; surface; 18 species

Acartia danae
Calanopia minor
Candacia longimana
Copilia quadrata
Corycaeus longistylis
Eucalanus attenuatus
Eucalanus monachus
Euchaeta marina
Heterorhabdus papilliger
Labidocera acutifrons
Labidocera minuta
Macrosetella gracilis
Paracalanus parvus
Pareuchaeta tonsa
Rhincalanus nasutus
Temora discaudata
Temora stylifera
Undinula vulgaris

5495. Lat. 9°06'30" N., long. 125°00'20" E.; between Leyte and Mindanao, Philippine Islands; August 2, 1909; 600–0 fathoms; 3 species

Heterorhabdus clausii
Megacalanus longicornis
Oncaea conifera

†5507. Lat. 8°21'12" N., long. 124°12'06" E.; off northern Mindanao, Philippine Islands; August 5, 1909; 10 feet to surface; 11 species

Acrocalanus gracilis
Corycaeus pumilus
Corycaeus speciosus
Eucalanus monachus
Farranula gibbula
Oncaea minuta
Oncaea venusta
Pseudocalanus minutus
Undinula caroli
Undinula darwinii
Undinula vulgaris

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5530. Lat. 9°26′45″ N., long. 123°38′30″ E.; between Siquijor and Bohol, Philippine Islands; August 11, 1909; surface; 31 species

Acartia danae
Acartia longiremis
Calanopia aurivillii
Candacia simplex
Copilia quadrata
Corycaeus agilis
Corycaeus latus
Corycaeus lautus
Corycaeus longistylis
Corycaeus speciosus
Eucalanus monachus
Farranula gibbula
Farranula rostrata
Labidocera acuta
Labidocera acutifrons
Labidocera detruncata
Labidocera lubbockii
?Lubbockia brevis
Lubbockia squillimana
Lucicutia flavicornis
Macrosetella gracilis
Nannocalanus minor
Neocalanus gracilis
Oncaea minuta
Oncaea venusta
Pontellina plumata
Pseudocalanus minutus
Sapphirina auronitens
Sapphirina nigromaculata
Temora stylifera
Undinula vulgaris

5538. Lat. 9°08′15″ N., long. 128°23′20″ E.; between Negros and Siquijor, Philippine Islands; August 19, 1909; [surface?]; 1 species

Corycaeus agilis

5553. Lat. 5°51′ N., long. 120°46′30″ E.; off Jolo, Philippine Islands; September 17, 1909; surface; 31 species

Calanopia elliptica
Candacia aethiopica
Candacia simplex
Canthocalanus pauper
Copilia mirabilis
Copilia quadrata
Corycaeus agilis
Eucalanus attenuatus
Eucalanus crassus
Eucalanus elongatus
Eucalanus mucronatus
Euchirella curticauda
Labidocera acuta
Labidocera krøyeri
Labidocera minuta
Macandrewella sewelli
Megacalanus longicornis
Nannocalanus minor
Oncaea venusta
Pareuchaeta gracilis
Phaënna spinifera
Pontella diagonalis
Rhincalanus cornutus
Sapphirina longifurca
Sapphirina metallina
Scolecithricella auropecten
Scolecithricella bradyi
Scolecithrix danae
Temora discaudata
Temora stylifera
Undinula vulgaris

5578. Lat. 5°14′38″ N., long. 119°57′57″ E.; north of Tawi Tawi, Philippine Islands; September 23, 1909; surface; 14 species

Calanopia minor
Candacia aethiopica
Candacia simplex
Corycaeus speciosus
Eucalanus mucronatus
Euchaeta marina
Euchaeta spinosa
Haloptilus ornatus
Pareuchaeta gracilis
Pareuchaeta incisa
Pareuchaeta norvegica
Phaënna spinifera
Sapphirina longifurca
Undinula vulgaris

5595. Lat. 6°54′ N., long. 122°04′30″ E.; off Mindanao, Philippine Islands; October 6, 1909; surface; 5 species

Eucalanus attenuatus
Eucalanus crassus
Undeuchaeta major
Undeuchaeta plumosa
Undinula vulgaris

5596. Lat. 6°54′ N., long. 122°04′30″ E.; off Mindanao, Philippine Islands; October 10, 1909; surface; 1 species

Undinula vulgaris

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†5601. Lat. 1°13′10″ N., long. 125°17′05″ E.; Gulf of Tomini, Celebes; November 13, 1909; just below surface; 20 species

Acartia danae
Acartia longiremis
Calanopia aurivillii
Candacia bipinnata
Corycaeus latus
Corycaeus lautus
Eucalanus attenuatus
Eucalanus monachus
Farranula rostrata
Labidocera acutifrons
Macrosetella gracilis
Microsetella norvegica
Microsetella rosea
Neocalanus gracilis
Oncaea minuta
Paracalanus parvus
Pontella fera
Sapphirina auronitens
Temora stylifera
Undinula caroli

5611. Lat. 00°40′30″ S., long. 121°50′ E.; Gulf of Tomini, Celebes; November 19, 1909; surface; 11 species

Candacia simplex
Centropages calaninus
Copilia mirabilis
Copilia quadrata
Eucalanus attenuatus
Eucalanus crassus
Eucalanus mucronatus
Euchaeta marina
Labidocera acuta
Rhincalanus cornutus
Rhincalanus nasutus

5627. Lat. 00°06′ N., long. 127°26′ E.; off Kayoa Island, Philippine Islands; November 29, 1909; 5–0 fathoms; 2 species

Copilia quadrata
Euchaeta marina

5633. Lat. 1°03′ S., long. 127°44′ E.; south of Patiente Strait; December 2, 1909; surface; 8 species

Candacia simplex
Copilia mirabilis
Eucalanus attenuatus
Eucalanus subcrassus
Euchirella intermedia
Pareuchaeta bisinuata
Pleuromamma xiphias
Undinula vulgaris

5640. Lat. 4°27′ S., long. 122°55′40″ E.; Buton Strait; December 13, 1909; surface; 2 species

Copilia mirabilis
Sapphirina longifurca

5646. Lat. 5°31′30″ S., long. 122°22′40″ E.; Buton Strait; December 16, 1909; 456–0 fathoms; 15 species

Acrocalanus gracilis
Acrocalanus longicornis
Candacia aethiopica
Corycaeus longistylis
Farranula concinna
Farranula gibbula
Macrosetella gracilis
Nannocalanus minor
Oncaea minuta
Oncaea venusta
Sapphirina angusta
Temora discaudata
Temora stylifera
Undinula caroli
Undinula vulgaris

†5647. Lat. 5°34′ S., long. 122°18′15″ E.; Buton Strait; December 16, 1909; below surface; 10 species

Acartia danae
Acrocalanus gracilis
Eucalanus monachus
Farranula gibbula
Macrosetella gracilis
Microsetella rosea
Nannocalanus minor
Neocalanus gracilis
Paracalanus parvus
Temora discaudata

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†5651. Lat. 4°43′50″ S., long. 121°23′24″ E.; Gulf of Boni, Celebes; December 17, 1909; surface; 28 species

Acartia danae
Acrocalanus gibber
Acrocalanus gracilis
Acrocalanus longicornis
Calocalanus pavo
Calocalanus styliremis
Centropages furcatus
Chiridius armatus
Clausocalanus arcuicornis
Corycaeus latus
Corycaeus longistylis
Corycaeus ovalis
Corycaeus pacificus
Eucalanus monachus
Farranula carinata
Farranula gibbula
Macrosetella gracilis
Microsetella rosea
Nannocalanus minor
Oithona similis
Oncaea minuta
Oncaea venusta
Paracalanus parvus
Pseudocalanus minutus
Temora discaudata
Temora longicornis
Temora stylifera
Undinula vulgaris

5653. Lat. 4°27′36″ S., long. 121°16′36″ E.; Gulf of Boni, Celebes; December 17, 1909; surface; 3 species

Acrocalanus gracilis
Corycaeus ovalis
Farranula carinata

5655. Lat. 3°34′10″ S., long. 120°50′30″ E.; Gulf of Boni, Celebes; December 18, 1909; surface; 1 species

Calanus finmarchicus

5657. Lat. 3°19′40″ S., long. 120°36′30″ E.; Gulf of Boni, Celebes; December 19, 1909; surface; 1 species

Microsetella rosea

5661. Lat. 5°49′40″ S., long. 120°24′30″ E.; Flores Sea, Celebes; December 20, 1909; surface; 1 species

Temora discaudata

5672. Lat. 00°29′ S., long. 118°51′ E.; Macassar Strait, Celebes; December 30, 1909; surface; 3 species

Eucalanus attenuatus
Labidocera acuta
Temora stylifera

E. HYDROGRAPHIC STATIONS, 1889 AND 1891 [13]

(With Corresponding 1891 [Pacific] Cable Survey Stations in Parentheses)

1689. Lat. 32°39′30″ N., long. 119°07′45″ W.; off west coast United States; January 24, 1889; surface; 3 species

Calanus cristatus
Calanus finmarchicus
Eucalanus mucronatus

1888. Lat. 45°01′ N., long. 124°35′ W.; off coast of Oregon; August 30, 1889; surface; 1 species

Acartia longiremis

[13] Tanner, Z. L., Report of the results of the survey for the purpose of determining the practicability of laying a telegraphic cable between the United States and the Hawaiian Islands, Senate Doc. 153, 52d Cong., 1st Sess., 26 pp., 4 photos, 9 charts, 1892; Townsend, C. H., Dredging and other records of the United States Fish Commission Steamer *Albatross*, with bibliography relative to the work of the vessel, U. S. Fish Comm. Rep. for 1900, pp. 442, 445, 456–461, 480, 1901.

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2700. Lat. 35°37′ N., long. 126°41′ W.; California to Hawaii; October 13, 1891; surface; 8 species

Calanus cristatus
Calanus hyperboreus
Eucalanus attenuatus
Eucalanus elongatus
Eucalanus mucronatus
Metridia longa
Neocalanus gracilis
Pareuchaeta norvegica

2701. Lat. 35°33′ N., long. 126°59′30″ W.; California to Hawaii; October 13, 1891; surface; 3 species

Calanus finmarchicus
Eucalanus attenuatus
Eucalanus mucronatus

2718 (64). Lat. 33°54′30″ N., long. 131°45′ W.; California to Hawaii; October 15, 1891; surface; 28 species

Acartia danae
Calocalanus pavo
Canthocalanus pauper
Centropages calaninus
Clausocalanus furcatus
Corycaeus agilis
Corycaeus flaccus
Corycaeus robustus
Corycaeus speciosus
Farranula carinata
Farranula gibbula
Farranula gracilis
Farranula rostrata
Lucicutia flavicornis
Macrosetella gracilis
Mecynocera clausi
Microsetella norvegica
Microsetella rosea
Neocalanus gracilis
Oithona linearis
Oithona similis
Paracalanus parvus
Pseudocalanus minutus
Rhincalanus nasutus
Sapphirina auronitens
Scolecithrix danae
Undinula caroli
Undinula darwinii

2719 (65). Lat. 33°48′30″ N., long. 132°01′ W.; California to Hawaii; October 15, 1891; surface; 58 species

Acartia danae
Acrocalanus gibber
Acrocalanus gracilis
Aetideus armatus
Calocalanus pavo
Calocalanus styliremis
Candacia aethiopica
Candacia bipinnata
Candacia bispinosa
Candacia simplex
Centropages calaninus
Centropages violaceus
Clausocalanus arcuicornis
Clausocalanus furcatus
Corycaeus agilis
Corycaeus crassiusculus
Corycaeus flaccus
Corycaeus limbatus
Corycaeus longistylis
Corycaeus lubbockii
Corycaeus ovalis
Corycaeus pacificus
Corycaeus speciosus
Eucalanus attenuatus
Eucalanus crassus
Eucalanus elongatus
Eucalanus monachus
Euchaeta marina
Farranula carinata
Farranula gibbula
Farranula gracilis
Farranula rostrata
Heterorhabdus papilliger
Heterorhabdus spinifrons
Lubbockia squillimana
Lucicutia flavicornis
Macrosetella gracilis
Mecynocera clausi
Megacalanus longicornis
Microsetella rosea
Neocalanus gracilis
Oithona spinirostris
Oncaea conifera
Oncaea minuta
Oncaea similis
Oncaea venusta
Paracalanus aculeatus
Paracalanus parvus
Phaënna spinifera
Pleuromamma abdominalis
Pleuromamma gracilis
Pontellina plumata
Rhincalanus nasutus
Sapphirina auronitens
Scolecithrix danae
Temora discaudata
Undinula caroli
Undinula darwinii

2720 (66). Lat. 33°41′30″ N., long. 134°17′ W.; California to Hawaii; October 16, 1891; surface; 38 species

Acartia danae
Acartia negligens
Acrocalanus gibber
Acrocalanus gracilis
Calocalanus pavo
Candacia simplex
Centropages calaninus
Clausocalanus arcuicornis
Copilia denticulata
Corycaeus agilis
Corycaeus flaccus
Corycaeus lautus

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2720 (66). Lat. 33°41′30″ N., long. 134°17′ W., California to Hawaii; October 16, 1891; surface; 38 species—Continued

Corycaeus longistylis
Corycaeus pumilus
Corycaeus robustus
Corycaeus speciosus
Corycaeus typicus
Eucalanus elongatus
Eucalanus monachus
Eucalanus mucronatus
Farranula carinata
Farranula gibbula
Farranula gracilis
Farranula rostrata
Metridia lucens
Microsetella rosea
Neocalanus gracilis
Oithona similis
Oncaea minuta
Oncaea notopa
Oncaea venusta
Paracalanus parvus
Pleuromamma gracilis
Pseudocalanus minutus
Rhincalanus cornutus
Sapphirina auronitens
Temora discaudata
Undinula darwinii

2721 (67). Lat. 33°35′ N., long. 132°33′30″ W.; California to Hawaii; October 16, 1891; surface; 23 species

Acartia danae
Acrocalanus gracilis
Aetideus armatus
Calocalanus pavo
Centropages calaninus
Corycaeus longistylis
Eucalanus attenuatus
Eucalanus monachus
Farranula carinata
Farranula gracilis
Farranula rostrata
Lucicutia flavicornis
Metridia lucens
Microsetella norvegica
Microsetella rosea
Neocalanus gracilis
Oithona linearis
Oithona similis
Oithona spinirostris
Oncaea notopa
Oncaea venusta
Pleuromamma gracilis
Undinula darwinii

2722 (68). Lat. 33°29′30″ N., long. 132°50′ W.; California to Hawaii; October 16, 1891; surface; 9 species

Corycaeus agilis
Corycaeus ovalis
Farranula gracilis
Farranula rostrata
Microsetella rosea
Oncaea venusta
Paracalanus parvus
Pseudocalanus minutus
Undinula darwinii

2723 (69). Lat. 33°24′ N., long. 133°01′ W.; California to Hawaii; October 16, 1891; surface; 1 species

Neocalanus gracilis

2724 (70). Lat. 33°20′ N., long. 133°12′ W.; California to Hawaii; October 16, 1891; surface; 27 species

Acartia clausii
Acartia danae
Acartia negligens
Clausocalanus furcatus
Corycaeus agilis
Corycaeus crassiusculus
Corycaeus limbatus
Corycaeus ovalis
Corycaeus speciosus
Corycaeus typicus
Eucalanus elongatus
Euchaeta marina
Farranula carinata
Farranula gibbula
Farranula gracilis
Farranula rostrata
Lubbockia aculeata
Metridia lucens
Microsetella norvegica
Oncaea minuta
Oncaea venusta
Paracalanus parvus
Pseudocalanus minutus
Sapphirina auronitens
Temora discaudata
Temora stylifera
Undinula darwinii

2725 (71). Lat. 33°15′30″ N., long. 133°24′ W.; California to Hawaii; October 16, 1891; surface; 47 species

Acartia danae
Acartia negligens
Acrocalanus gibber
Acrocalanus gracilis
Aetideus armatus
Amallothrix emarginata
Calocalanus pavo
Candacia simplex
Centropages calaninus
Clausocalanus furcatus
Clytemnestra scutellata
Corycaeus agilis
Corycaeus catus
Corycaeus limbatus
Corycaeus ovalis
Corycaeus pumilus
Corycaeus typicus
Eucalanus elongatus
Eucalanus monachus
Eucalanus mucronatus
Euchaeta acuta
Euchaeta marina
Farranula carinata
Farranula gibbula

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2725 (71). Lat. 33°15'30" N., long. 133°24' W.; California to Hawaii; October 16, 1891; surface; 47 species—Continued

Farranula gracilis
Farranula rostrata
Heterorhabdus spinifrons
Lucicutia flavicornis
Macrosetella gracilis
Microsetella rosea
Nannocalanus minor
Oncaea minuta
Oncaea notopa
Oncaea similis
Oncaea venusta
Paracalanus parvus
Phaënna spinifera
Pseudocalanus minutus
Sapphirina auronitens
Sapphirina intestinata
Scolecithrix danae
Temora discaudata
Temora longicornis
Temora stylifera
Undinula caroli
Undinula darwinii
Undinula vulgaris

2727 (73). Lat. 33°08' N., long. 133°46' W.; California to Hawaii; October 16, 1891; surface; 22 species

Acartia danae
Acrocalanus gracilis
Amallothrix emarginata
Augaptilus glacialis
Centropages calaninus
Corycaeus catus
Eucalanus monachus
Farranula carinata
Farranula gibbula
Farranula rostrata
Macrosetella gracilis
Microsetella rosea
Oithona similis
Oncaea conifera
Oncaea minuta
Oncaea notopa
Oncaea similis
Paracalanus parvus
Pseudocalanus minutus
Sapphirina auronitens
Temora discaudata
Undinula vulgaris

2728 (74). Lat. 33°04'30" N., long. 133°56'30" W.; California to Hawaii; October 16, 1891; surface; 1 species

Undeuchaeta plumosa

2729 (75). Lat. 33°01' N., long. 134°08' W.; California to Hawaii; October 16, 1891; surface; 34 species

Acartia longiremis
Amallothrix emarginata
Centropages furcatus
Centropages violaceus
Clausocalanus arcuicornis
Clausocalanus furcatus
Corycaeus agilis
Corycaeus crassiusculus
Corycaeus dubius
Corycaeus flaccus
Corycaeus lautus
Corycaeus speciosus
Corycaeus typicus
Eucalanus attenuatus
Eucalanus monachus
Euchaeta marina
Farranula gracilis
Farranula rostrata
Heterorhabdus papilliger
Mecynocera clausi
Microsetella rosea
Oithona plumifera
Oithona similis
Oncaea minuta
Oncaea notopa
Oncaea venusta
Paracalanus parvus
Phaënna spinifera
Rhincalanus cornutus
Rhincalanus nasutus
Scolecithrix danae
Undinula caroli
Undinula darwinii
Undinula vulgaris

2730 (76). Lat. 32°57'30" N., long. 134°18'30" W.; California to Hawaii; October 16, 1891; surface; 30 species

Acartia negligens
Candacia bipinnata
Candacia bispinosa
Centropages furcatus
Copilia denticulata
Corycaeus speciosus
Corycaeus typicus
Eucalanus attentuatus
Eucalanus elongatus
Eucalanus monachus
Euchaeta acuta
Euchaeta marina
Euchirella brevis
Farranula rostrata
Gaetanus recticornis
Lucicutia longicornis
Mecynocera clausi
Microsetella rosea
Oithona plumifera
Oithona similis
Oncaea minuta
Oncaea venusta
Pareuchaeta tonsa
Pseudocalanus minutus
Rhincalanus nasutus
Scolecithrix danae
Spinocalanus abyssalis
Undinula caroli
Undinula darwinii
Undinula vulgaris

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2731 (77). Lat. 32°54′ N., long. 134°30′ W.; California to Hawaii; October 17, 1891; surface; 27 species

Acartia danae	Euchaeta marina	Sapphirina angusta
Acartia negligens	Microsetella rosea	Sapphirina auronitens
Candacia bispinosa	Nannocalanus minor	Scolecithricella bradyi
Centropages furcatus	Oncaea venusta	Scolecithrix danae
Clausocalanus arcuicornis	Pareuchaeta incisa	Temora discaudata
Corycaeus speciosus	Pareuchaeta tonsa	Temora stylifera
Eucalanus elongatus	Phaënna spinifera	Undinula caroli
Eucalanus monachus	Pleuromamma gracilis	Undinula darwinii
Euchaeta acuta	Rhincalanus nasutus	Undinula vulgaris

2732 (78). Lat. 32°50′ N., long. 134°40′30″ W.; California to Hawaii; October 17, 1891; surface; 19 species

Eucalanus attenuatus	Oncaea venusta	Temora discaudata
Eucalanus crassus	Pareuchaeta tonsa	Temora stylifera
Eucalanus elongatus	Rhincalanus nasutus	Undinula caroli
Eucalanus monachus	Sapphirina auronitens	Undinula darwinii
Euchaeta acuta	Sapphirina lactens	Undinula vulgaris
Euchaeta marina	Scolecithricella bradyi	
Lucicutia flavicornis	Scolecithrix danae	

2733 (79). Lat. 32°46′30″ N., long. 134°52′ W.; California to Hawaii; October 17, 1891; surface; 15 species

Centropages calaninus	Farranula rostrata	Paracalanus parvus
Centropages furcatus	Mecynocera clausi	Pleuromamma gracilis
Clausocalanus arcuicornis	Microsetella rosea	Scolecithrix danae
Eucalanus monachus	Nannocalanus minor	Temora discaudata
Farranula carinata	Oncaea venusta	Undinula vulgaris

2734 (80). Lat. 32°46′ N., long. 134°54′ W.; California to Hawaii; October 17, 1891; surface; 23 species

Acrocalanus gracilis	Eucalanus elongatus	Microsetella rosea
Calanus tonsus	Eucalanus monachus	Oncaea venusta
Centropages calaninus	Euchaeta marina	Pareuchaeta tonsa
Centropages furcatus	Farranula carinata	Scolecithrix danae
Copilia denticulata	Farranula gibbula	Temora stylifera
Corycaeus agilis	Farranula gracilis	Undinula darwinii
Corycaeus catus	Farranula rostrata	Undinula vulgaris
Corycaeus speciosus	Heterorhabdus spinifrons	

2735 (81). Lat. 32°44′40″ N., long. 134°58′ W.; California to Hawaii; October 17, 1891; surface; 8 species

Centropages furcatus	Oncaea minuta	Scolecithrix danae
Centropages violaceus	Paracalanus aculeatus	Temora stylifera
Clausocalanus arcuicornis	Paracalanus parvus	

2736 (82). Lat. 32°44′ N., long. 135°00′ W.; California to Hawaii; October 17, 1891; surface; 12 species

Centropages calaninus	Corycaeus dubius	Oncaea venusta
Clausocalanus arcuicornis	Farranula carinata	Paracalanus parvus
Clytemnestra rostrata	Farranula rostrata	Scolecithrix danae
Corycaeus agilis	Microsetella rosea	Undinula darwinii

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2794 (139). Lat. 32°12′30″ N., long. 136°00′30″ W.; California to Hawaii; November 9, 1891; surface; 1 species

Pontella atlantica

2828 (173). Lat. 29°43′ N., long. 142°04′30″ W.; California to Hawaii; November 12, 1891; surface; 4 species

Candacia simplex
Euchaeta marina
Lucicutia flavicornis
Pontella fera

2877 (222). Lat. 25°14′ N., long. 150°39′ W.; California to Hawaii; November 17, 1891; surface; 4 species

Candacia longimana
Gaetanus armiger
Lucicutia flavicornis
Pleuromamma xiphias

2878 (223). Lat. 25°08′ N., long. 150°50′ W.; California to Hawaii; November 17, 1891; surface; 1 species

Pontella securifer

2892 (236). Lat. 23°49′ N., long. 153°20′ W.; California to Hawaii; November 18, 1891; surface; 8 species

Clausocalanus arcuicornis
Euchaeta marina
Neocalanus gracilis
Neocalanus robustior
Pleuromamma abdominalis
Pontella danae
Pontella fera
Undinula darwinii

3116 (470). Lat. 30°29′ N., long. 136°51′ W.; California to Hawaii; December 25, 1891; surface; 8 species

Acartia danae
Euaetideus giesbrechti
Heterorhabdus norvegicus
Heterorhabdus spinifrons
Scolecithricella bradyi
Scolecithricella dentata
Scolecithricella vittata
Undinula caroli

3120 (474). Lat. 30°38′ N., long. 136°23′ W.; California to Hawaii; December 26, 1891; surface; 1 species

Gaidius pungens

3782 [Agassiz Station 7]. Lat. 18°19′ N., long. 134°57′ W.; California to Marquesas Islands; September 1, 1899; surface; 1 species

Centropages calaninus

3786 [Agassiz Station 12]. Lat. 12°07′ N., long. 137°18′ W.; California to Marquesas Islands; September 4, 1899; surface; 1 species

Pontella danae

3789 [Agassiz Station 16]. Lat. 02°38′ N., long. 137°22′ W.; California to Marquesas Islands; September 9, 1899; 250–0 fathoms; 7 species

Bathycalanus richardi
Dysgamus pacificus
Gaetanus kruppii
Megacalanus longicornis
Pareuchaeta hansenii
Pseudochirella obtusa
Undeuchaeta plumosa

3798 [Agassiz Station 27]. Cape Martin, Nukuhiva Island, N. 30° E.; distance 6½ miles; September 15, 1899; 300–0 fathoms; 1 species

Gaetanus antarcticus

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F. UNNUMBERED LOCALITIES

Okhotsk Sea

Robben Island; surface; 1 species

Pontella pulvinata

Alaska

Amchitka Island; August, 1893; 2 species

Calanus finmarchicus
Eucalanus mucronatus

Attu Island, collected by Victor Scheffer, June 10, 1937; 1 species

Acartia tumida

Behm Canal; August, 1893; 1 species

Calanus finmarchicus

Kodiak Island, anchorage; August, 1893; 2 species

Acartia longiremis
Robertsonia tenuis

Rat Island, collected by Victor B. Scheffer, June 26, 1932; 1 species

Tigriopus incertus

Yes Bay; 4 species

Calanus finmarchicus
Gaidius tenuispinus
Metridia lucens
Pseudocalanus minutus

British Columbia

Beaver Harbor, Vancouver Island; September, 1888; 3 species

Acartia longiremis
Harpacticus chelifer
Pontella tenuiremis

Pacific, Eastern Tropical

Charles Island, Galápagos [1891 or 1904–5?]; surface; 12 species

Acrocalanus gracilis
Calanopia minor
Centropages furcatus
Farranula rostrata
Metridia longa
Nannocalanus minor
Neocalanus tenuicornis
Oncaea venusta
Phaënna spinifera
Pseudocalanus minutus
Temora discaudata
Temora stylifera

Pacific, South and West

***Ellice Islands; Funafuti; December 23, 1899; surface; 5 species**

Macandrewella agassizi
Macandrewella chelipes
Pachyptilus abbreviatus
Pontella tenuiremis
Scolecithrix danae

***Fiji Islands, off Mbatiki Island; surface; December 1897; 1 species**

Macrosetella gracilis

***Fiji Islands, east entrance Mhengha Passage; December 16, 1897; surface; 1 species**

Acartia danae

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***Fiji Islands, off Kimbombo Island; December 1897; 40 fathoms; 1 species**

Acartia danae

***Fiji Islands, south of Suva Light; November 1897; surface; 71 species**

Acartia hamata
Acartia negligens
Acrocalanus gibber
Acrocalanus gracilis
Acrocalanus monachus
Aetideus armatus
Calanopia elliptica
Calanopia sarsi
Calocalanus pavo
Calocalanus styliremis
Candacia aethiopica
Candacia simplex
Canthocalanus pauper
Centropages calaninus
Centropages furcatus
Centropages orsinii
Centropages violaceus
Clausocalanus arcuicornis
Conaea gracilis
Copilia quadrata
Corycaeus agilis
Corycaeus catus
Corycaeus clausi
Corycaeus flaccus
Corycaeus limbatus
Corycaeus longistylis
Corycaeus ovalis
Corycaeus speciosus
Corycaeus typicus
Euaetideus giesbrechti
Euaugaptilus elongatus
Eucalanus attenuatus
Eucalanus elongatus
Eucalanus muticus
Euchaeta acuta
Euchaeta longicornis
Euchaeta marina
Farranula gibbula
Farranula gracilis
Farranula rostrata
Haloptilus longicornis
Haloptilus spiniceps
Heterorhabdus spinifrons
Lophothrix frontalis
Lubbockia squillimana
Lucicutia flavicornis
Macandrewella chelipes
Macrosetella gracilis
Mecynocera clausi
Nannocalanus minor
Neocalanus gracilis
Neocalanus robustior
Neocalanus tenuicornis
Oculosetella gracilis
Oithona plumifera
Oithona similis
Oithona spinirostris
Oithonina nana
Oncaea minuta
Oncaea venusta
Pachyptilus abbreviatus
Paracalanus parvus
Phaënna spinifera
Pontellina plumata
Pseudocalanus minutus
Sapphirina auronitens
Scolecithricella vittata
Scolecithrix danae
Temora stylifera
Undinula caroli
Undinula vulgaris

***Fiji Islands, off Taviuni Island; November-December 1897; surface; 24 species**

Acartia danae
Acrocalanus gibber
Acrocalanus gracilis
Calocalanus pavo
Candacia simplex
Centropages hamatus
Corycaeus agilis
Corycaeus clausi
Corycaeus longistylis
Corycaeus ovalis
Corycaeus speciosus
Euchaeta marina
Farranula gibbula
Farranula rostrata
Lubbockia squillimana
Lucicutia flavicornis
Macrosetella gracilis
Neocalanus gracilis
Neocalanus robustior
Oncaea minuta
Oncaea venusta
Phaënna spinifera
Sapphirina auronitens
Undinula vulgaris

***Fiji Islands, off Vatu Leile; surface; December 1897; 7 species**

Acrocalanus monachus
Calocalanus pavo
Copilia quadrata
Corycaeus agilis
Corycaeus typicus
Macrosetella gracilis
Neocalanus gracilis

Friendly [Tonga] Islands; [1899?] surface; 1 species

Farranula rostrata

***Gilbert Islands; Butaritari Lagoon, Makin Island; January 6, 1900; surface; 16 species**

Acartia danae
Acartia hamata
Calanopia elliptica
Copilia denticulata
Copilia vitrea
Corycaeus speciosus

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***Gilbert Islands; Butaritari Lagoon, Makin Island; January 6, 1900; surface; 16 species—Continued**

Gaidius affinis
Monstrilla serricornis
Sapphirina auronitens
Sapphirina metallina
Sapphirina salpae
Sapphirina stellata
Temora stylifera
Tortanus gracilis
Tortanus murrayi
Undinula vulgaris

Hawaiian Islands; 1 species

Calocalanus styliremis

Low Archipelago, Marokau Island anchorage; October 28, 1899; surface; 1 species

Gaetanus minor

Marshall Islands, Arno Atoll; January 26, 1900; surface; 7 species

Candacia simplex
Canthocalanus pauper
Centropages orsinii
Haloptilus longicornis
Pontellina plumata
Undinula vulgaris
Xanthocalanus pinguis

Niuafu Island; lat. 15°35′ S., long. 175°40′ W.; surface; 17 species

Acartia danae
Copilia mirabilis
Corycaeus agilis
Corycaeus lautus
Corycaeus longistylis
Corycaeus pacificus
Corycaeus typicus
Farranula concinna
Farranula gibbula
Farranula rostrata
Lubbockia squillimana
Macrosetella gracilis
Oithona linearis
Oncaea minuta
Oncaea venusta
Sapphirina auronitens
Sapphirina nigromaculata

PHILIPPINE ISLANDS

Butauanan Island, east of Luzón; [June 1909]; surface; 1 species

Pontella valida

Caldera Bay anchorage; west coast of Mindanao; February 6, 1908; surface; net set in tidal current off gangway; 13 species

Caligus thymni
Cymbasoma longispinosum
Cymbasoma rigidum
Harpacticus chelifer
Labidocera acuta
Labidocera insolita
Monstrilla clavata
Monstrilla leucopsis
Monstrilla serricornis
Pontella cerami
Pontella denticauda
Pontellopsis strenua
Undinula vulgaris

Iloilo Straits, between Panay and Guimaras; [January or March 1909?]; surface; 25 species

Calanopia minor
Canthocalanus pauper
Centropages furcatus
Corycaeus ovalis
Corycaeus pumilus
Corycaeus speciosus
Eucalanus monachus
Farranula carinata
Farranula gibbula
Labidocera acuta
Labidocera detruncata
Labidocera krøyeri
Labidocera tenuicauda
Macrosetella gracilis
Neocalanus gracilis
Oncaea minuta
Paracalanus parvus
Sapphirina auronitens
Temora longicornis
Temora stylifera
Temora turbinata
Tortanus murrayi
Tortanus recticauda
Undinula vulgaris
Valdiviella insignis

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Luzón Island; surface; 4 species

Eucalanus elongatus
Labidocera acuta
Pleuromamma gracilis
Pleuromamma piseki

Nasugbu Bay, southern Luzón; January 21, 1908; surface; 6 species

Candacia bispinosa
Eucalanus elongatus
Labidocera acuta
Pleuromamma gracilis
Pleuromamma piseki
Pontella surrecta

Port Binanga, Luzón; January 8, 1908; surface; 4 species

Candacia pachydactyla
Labidocera acuta
Labidocera pavo
Pontellopsis bitumida

Romblon Island, east of Mindoro; March 25, 1908; surface; 1 species

Pontella surrecta

Sabtán [or Sabtang] Island, Batan Islands, north of Luzon [June 1909?]; surface; 33 species

Acartia longiremis
Acrocalanus gibber
Acrocalanus gracilis
Acrocalanus longicornis
Amenophia peltata
Calanopia aurivillii
Candacia simplex
Centropages furcatus
Corycaeus latus
Corycaeus limbatus
Corycaeus longistylis
Corycaeus typicus
Eucalanus mucronatus
Farranula gibbula
Labidocera acutifrons
Labidocera detruncata
Labidocera lubbockii
Labidocera orsinii
Lubbockia squillimana
Macrosetella gracilis
Nannocalanus minor
Oithona similis
Oncaea minuta
Oncaea venusta
Pareuchaeta gracilis
Pleuromamma gracilis
Pleuromamma xiphias
Pontellina plumata
Pseudocalanus minutus
Sapphirina auronitens
Scolecithricella bradyi
Scolecithrix danae
Undinula vulgaris

G. WITHOUT DATA

***Albatross;* 1 species**

Dactylopusia vulgaris

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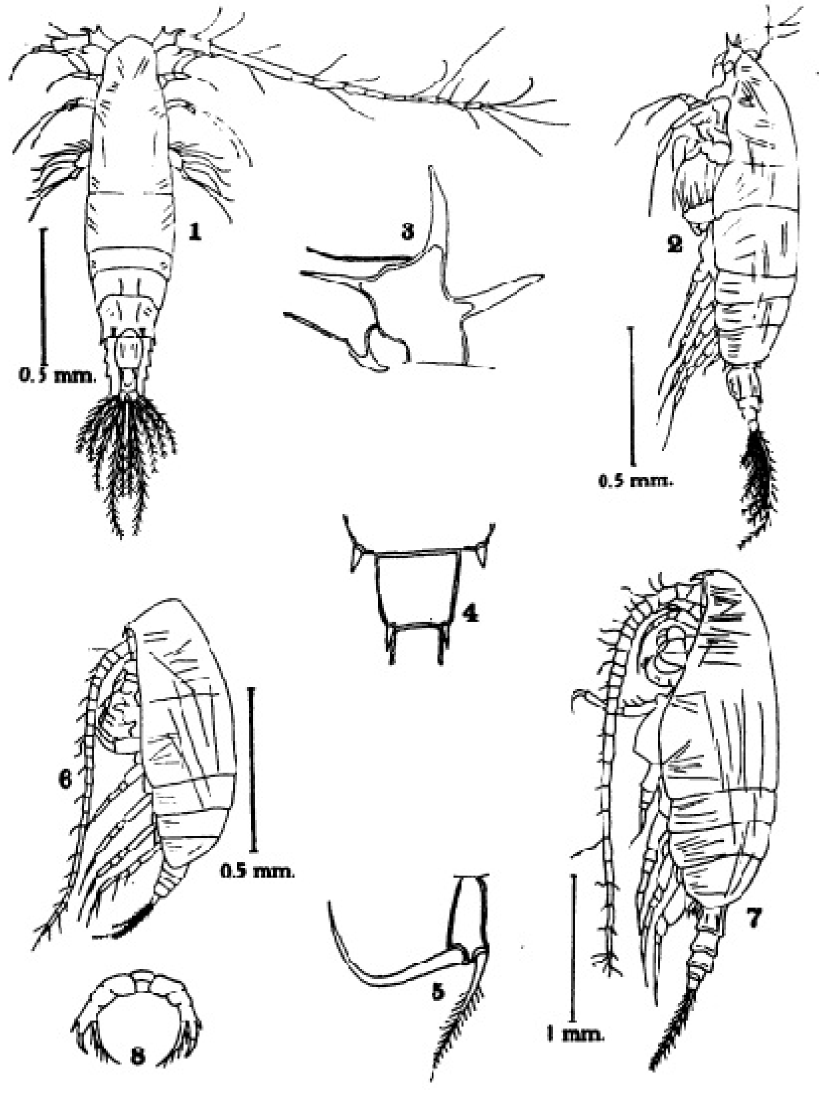
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SPECIES OF ACARTIA, ACROCALANUS, AND AMALLOTHRIX.

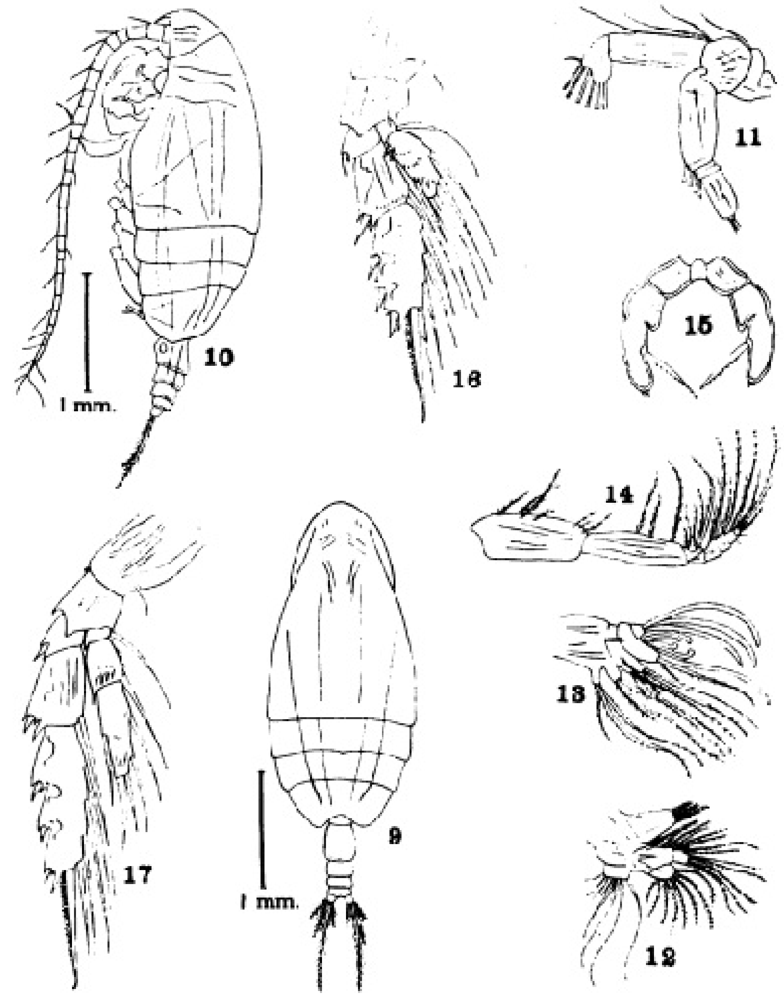
1–5, *Acartia hamata*, new species, female: 1, Dorsal view; 2, lateral view; 3, first antenna: first segment and proximal portion of second segment; 4, posterior margin of fused fourth-fifth thoracic segment and genital segment; 5, fifth leg.

6, *Acrocalanus monachus* Giesbrecht, female: Lateral view.

7, 8, *Amallothrix arcuata* (Sars), female: 7, Lateral view; 8, fifth legs.

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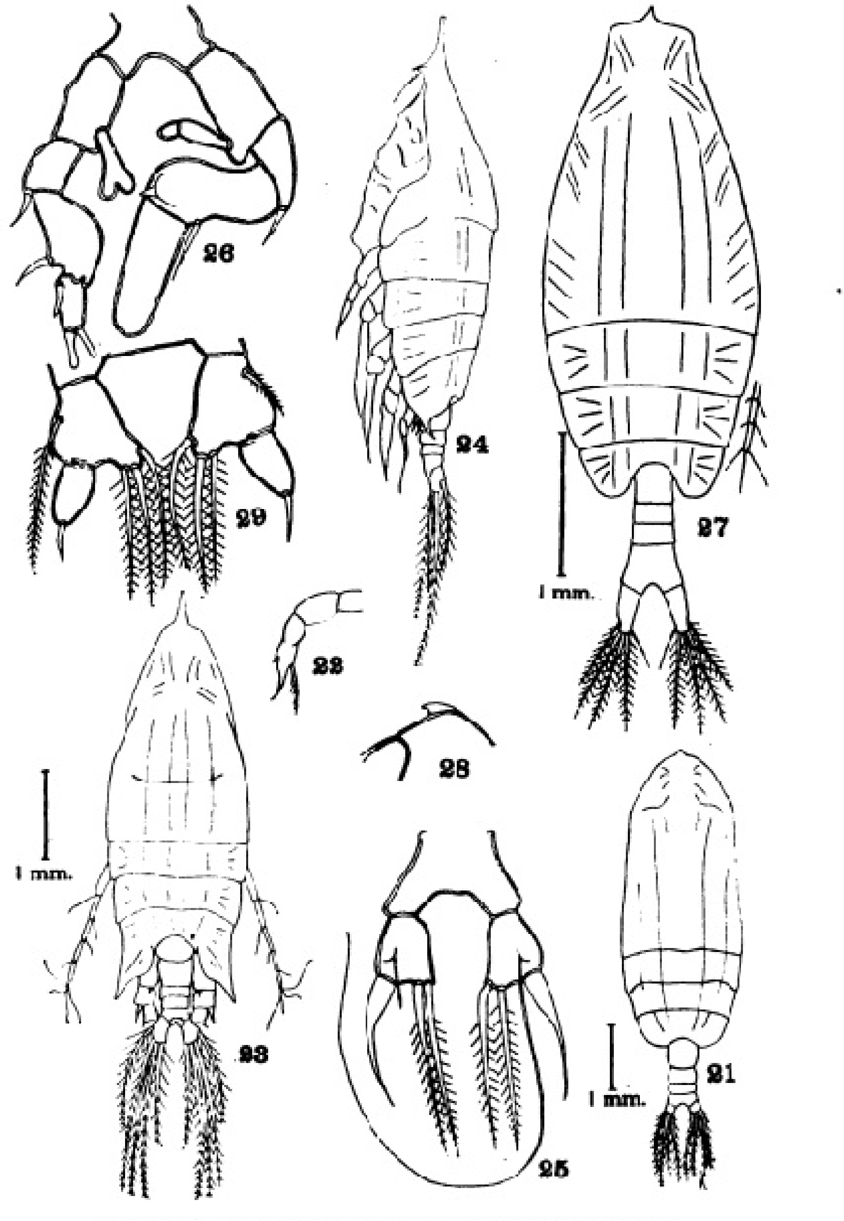
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AMALLOTHRIX INVENUSTA, NEW SPECIES, FEMALE.

9, Dorsal view; 10, lateral view; 11, second antenna; 12, first maxilla; 13, second maxilla; 14, maxilliped; 15, fifth legs; 16, second leg; 17, third leg.

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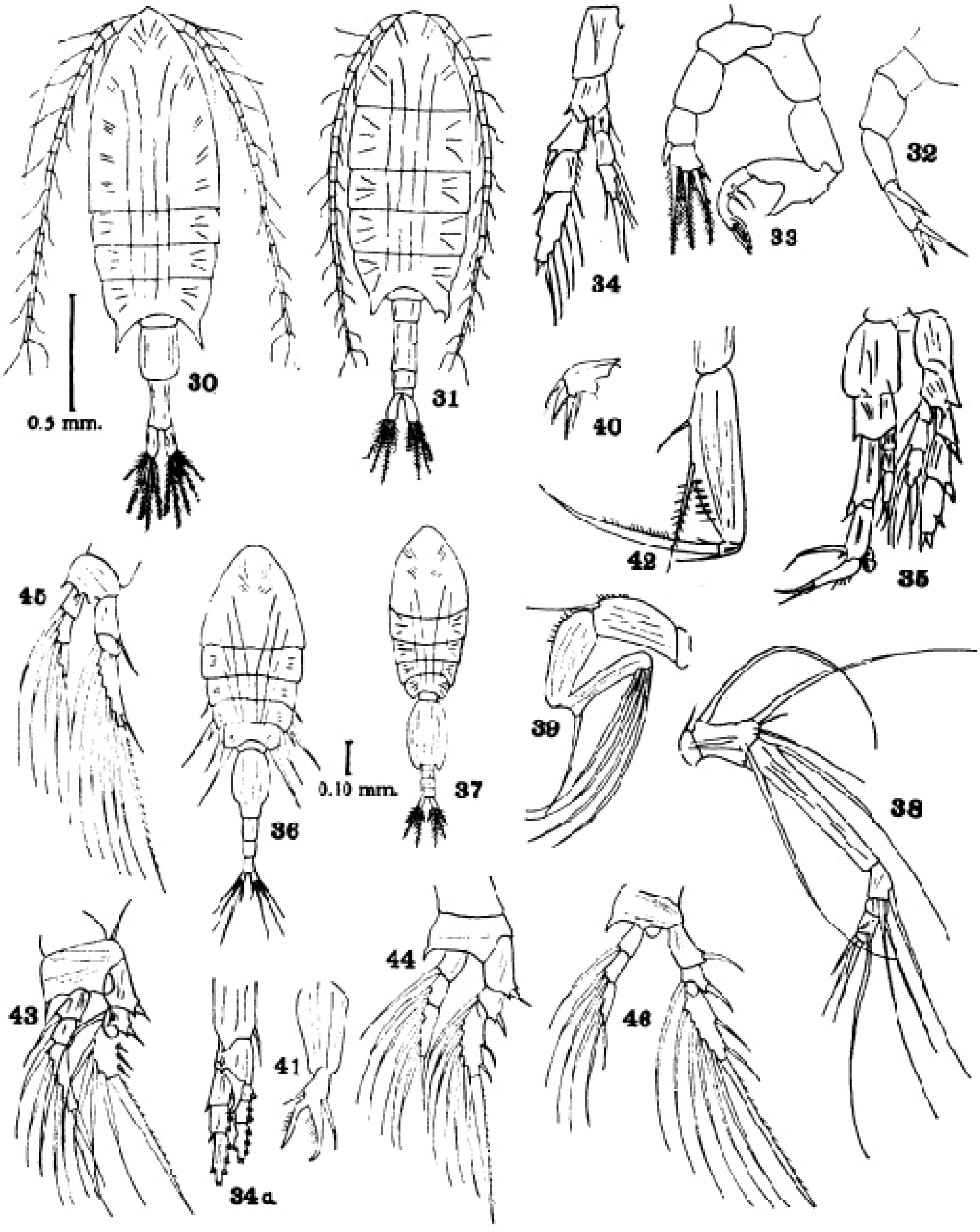
SPECIES OF AMALLOTHRIX AND ARIETELLUS.

21, 22, *Amallothrix obtusifrons* (Sars), female: 21, Dorsal view; 22, fifth leg.

23–26, *Arietellus armatus* Wolfenden; 23, Dorsal view, female; 24, lateral view, female; 25, fifth legs, female; 26, fifth legs, male.

27–29, *Arietellus tripartitus*, new species, female: 27, Dorsal view; 28, crest and rostral filaments in lateral view; 29, fifth legs.

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SPECIES OF CALANOPIA, CANTHOCALANUS, AND CONAEA.

30–33, *Calanopia sarsi*, new species: 30, Dorsal view, female; 31, dorsal view, male; 32, fifth leg, female; 33, fifth legs, male.

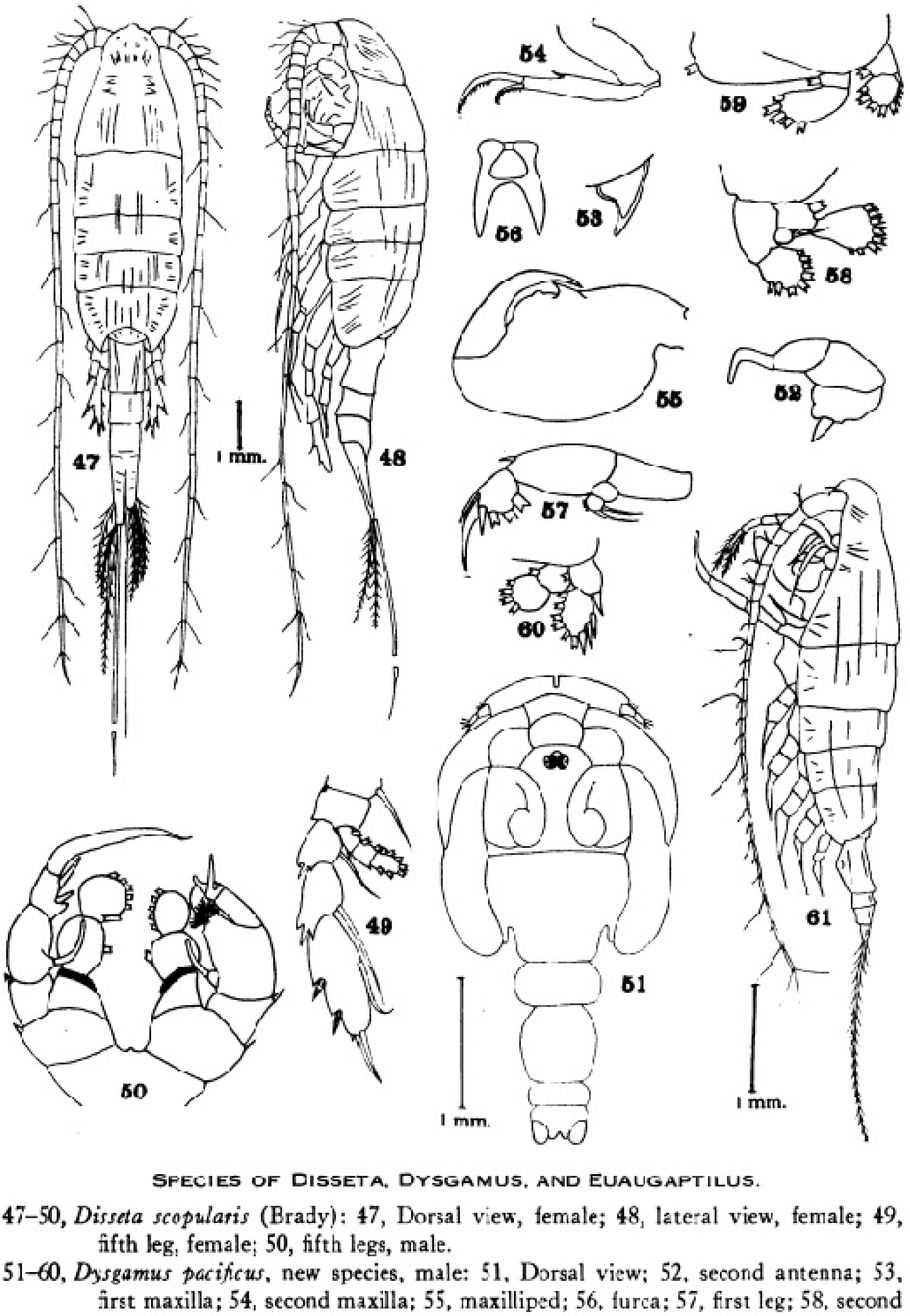
34–35, *Canthocalanus pauper* (Giesbrecht): 34, Fifth leg, female; 34a, first leg, sex?; 35, fifth legs, male.

36, 37, *Conaea gracilis* (Dana); 36, Dorsal view, female; 37, dorsal view, male.

38–46, *Conaea gracilis* (Dana), sex?: 38, First antenna; 39, second antenna; 40, first maxilla; 41, second maxilla; 42, maxilliped; 43, first leg; 44, second leg; 45, fourth leg; 46, third leg.

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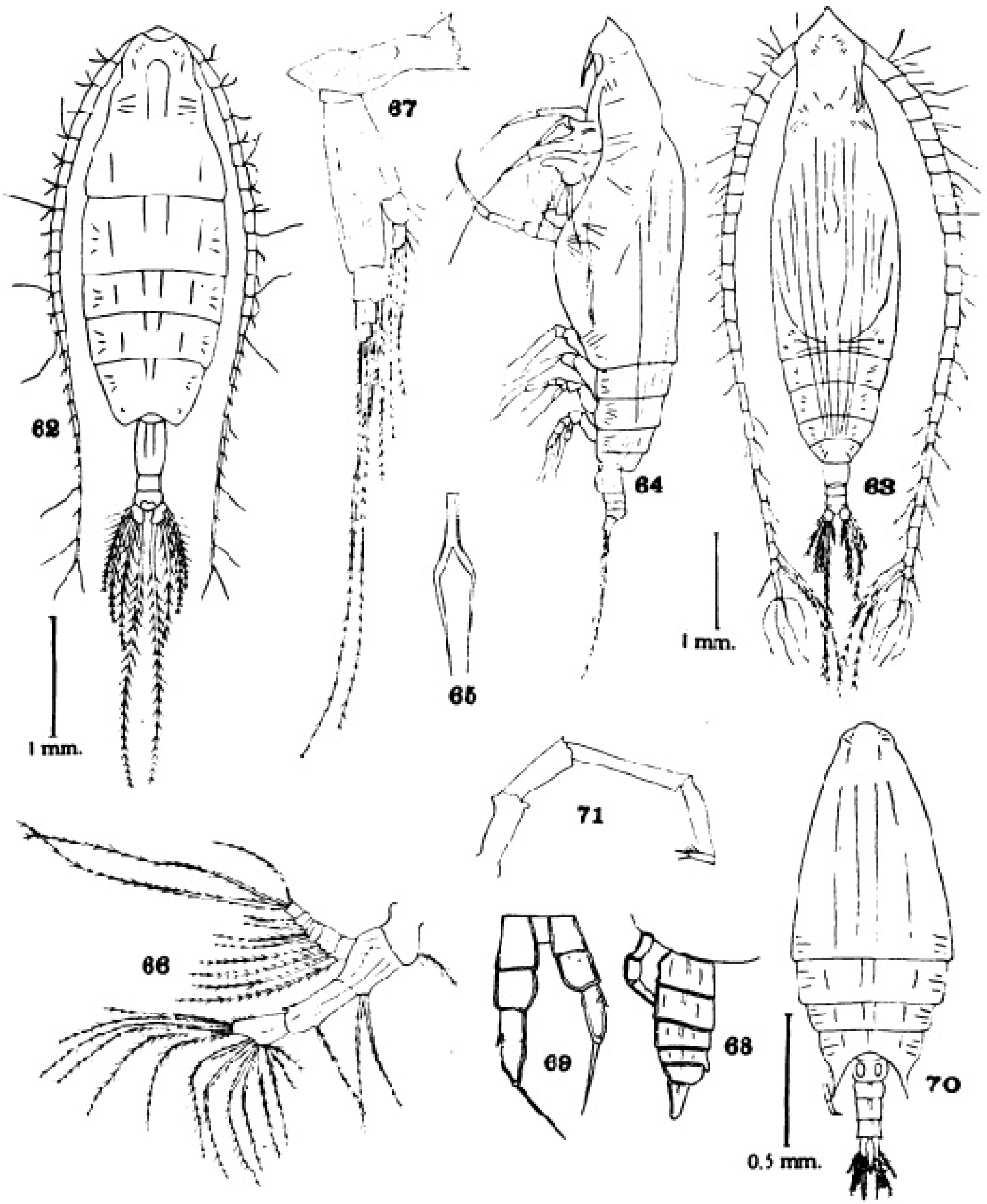
SPECIES OF DISSETA, DYSGAMUS, AND EUAUGAPTILUS.

47–50, *Disseta scopularis* (Brady): 47, Dorsal view, female; 48, lateral view, female; 49, fifth leg, female; 50, fifth legs, male.

51–60, *Dysgamus pacificus*, new species, male: 51, Dorsal view; 52, second antenna; 53, first maxilla; 54, second maxilla; 55, maxilliped; 56, furca; 57, first leg; 58, second leg; 59, third leg; 60, fourth leg.

61, *Euaugaptilus rigidus* (Sars), female: Lateral view.

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SPECIES OF EUAUGAPTILUS, EUCALANUS, AND EUAETIDIUS.

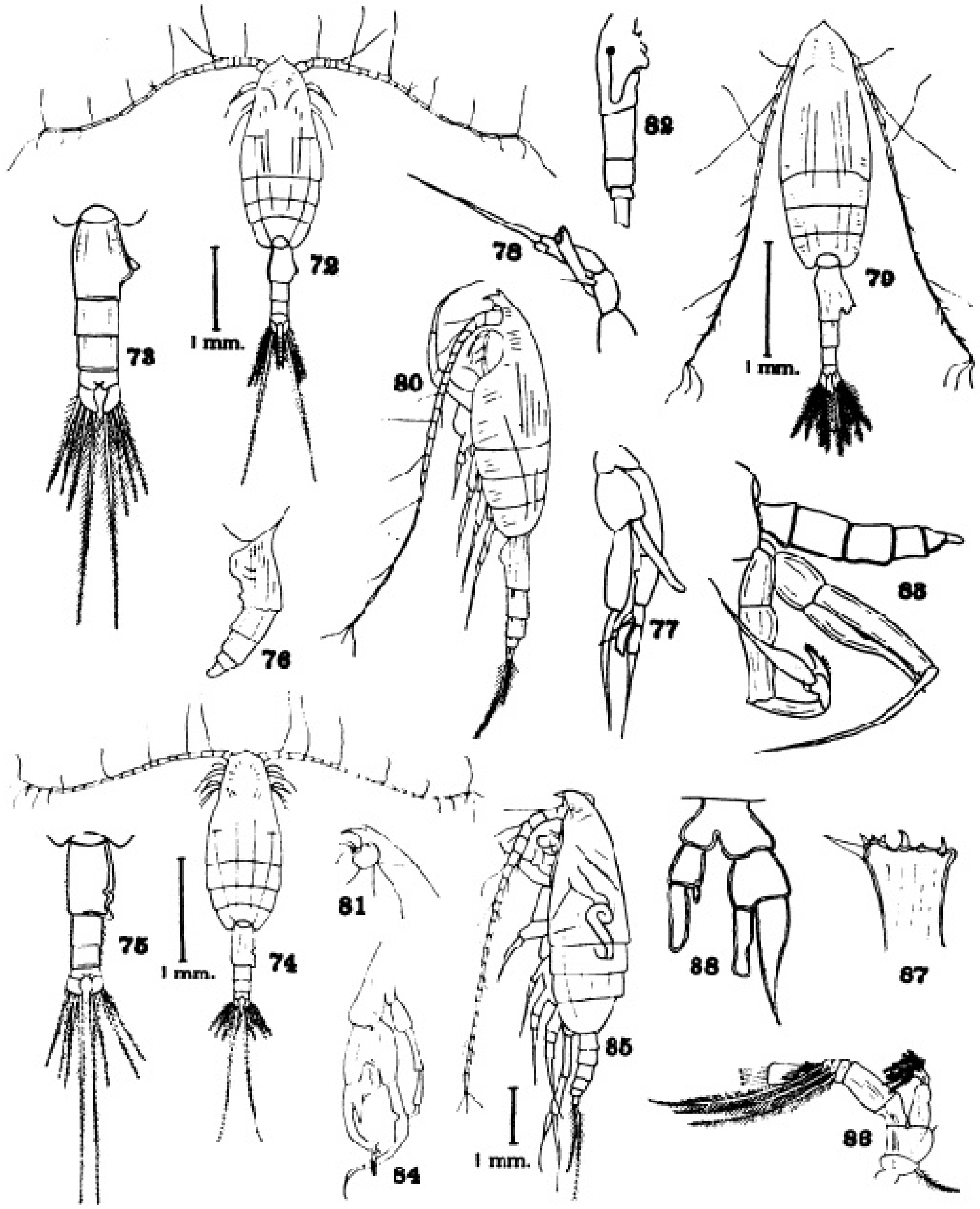
62. *Euaugaptilus rigidus* (Sars), female: Dorsal view

63–67, *Eucalanus muticus* [Sars MS.] Wilson, new species, female: 63, Dorsal view; 64, lateral view; 65, rostral filaments; 66, second antenna; 67, mandible.

68, 69, *Eucalanus muticus* [Sars MS.] Wilson, new species, male: 68, Urosome; 69, fifth legs.

70, 71, *Euaetidius bradyi* (A. Scott), male: 70, Dorsal view; 71, fifth leg.

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SPECIES OF EUCHAETA AND EUCHIRELLA.

72, 73, *Euchaeta concinna* Dana, female: 72, Dorsal view; 73, urosome.

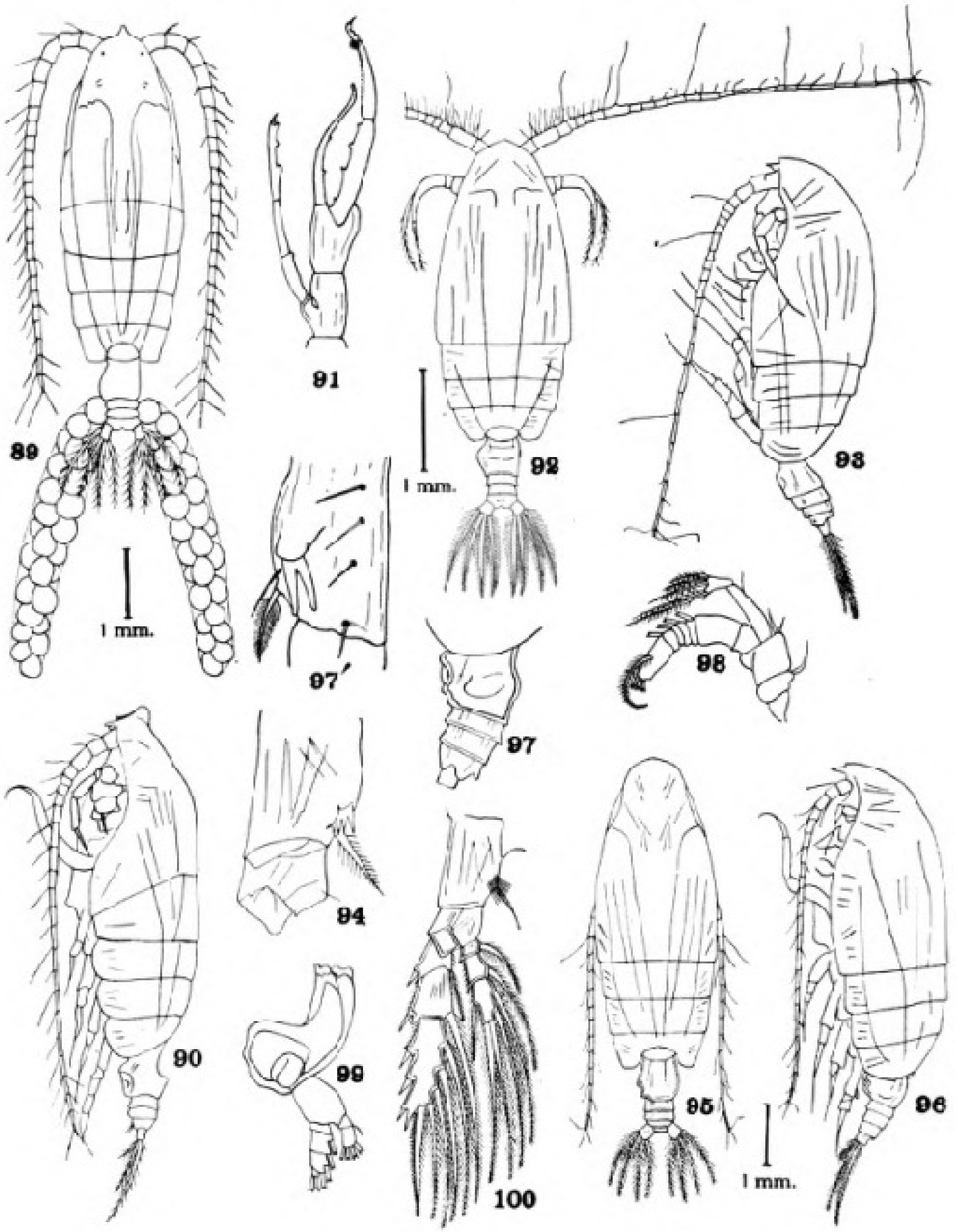
74–78, *Euchaeta wolfendeni* A. Scott: 74, Dorsal view, female; 75, urosome, dorsal view, female; 76, urosome, lateral view, female; 77, fifth legs, male; 78, distal segments of left fifth leg, male.

79–83, *Euchaeta longicornis* Giesbrecht, female: 79, Dorsal view, 80, lateral view from left side; 81, rostrum in lateral view; 82, urosome, lateral view from right side; 83, fifth legs.

84, *Euchirella bella* Giesbrecht, male: 84, Fifth legs.

85–88, *Euchirella galeata* Giesbrecht: 85, Lateral view, male; 86, second antenna, male; 87, chewing blade of mandible, male; 88, fifth legs, immature male.

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SPECIES OF EUCHIRELLA.

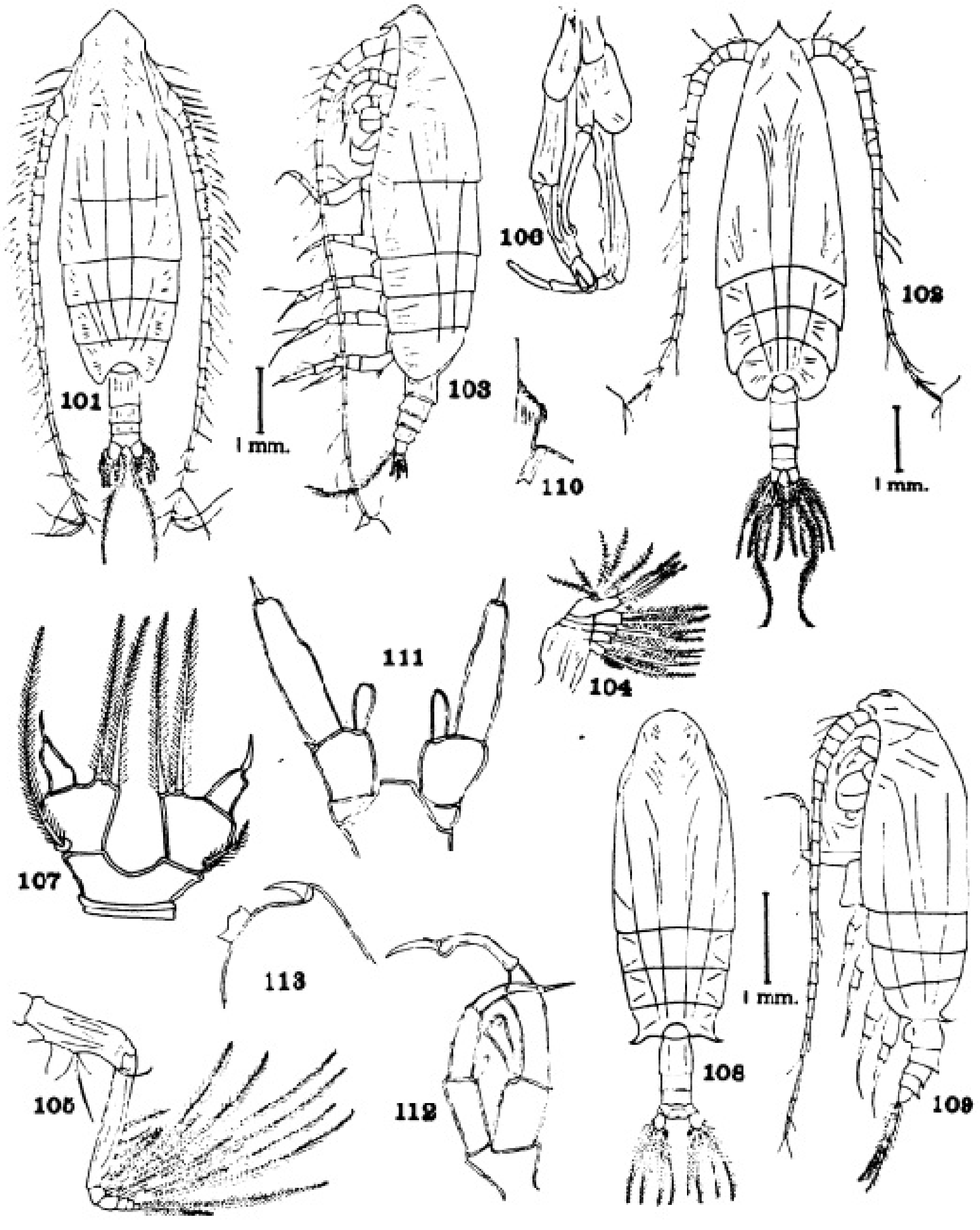
89–91, *Euchirella galeata* Giesbrecht: 89, Dorsal view, female; 90, lateral view, female; 91, fifth legs, male.

92–94, *Euchirella bella* Giesbrecht, female: 92, Dorsal view; 93, lateral view; 94, basipod of fourth leg.

95–97′, *Euchirella venusta* Giesbrecht, female: 95, Dorsal view; 96, lateral view; 97, urosome, lateral view; 97′, basipod of fourth leg.

98–100, *Euchirella grandicornis*, new species, female: 98, Second antenna; 99, mandible; 100, fourth leg.

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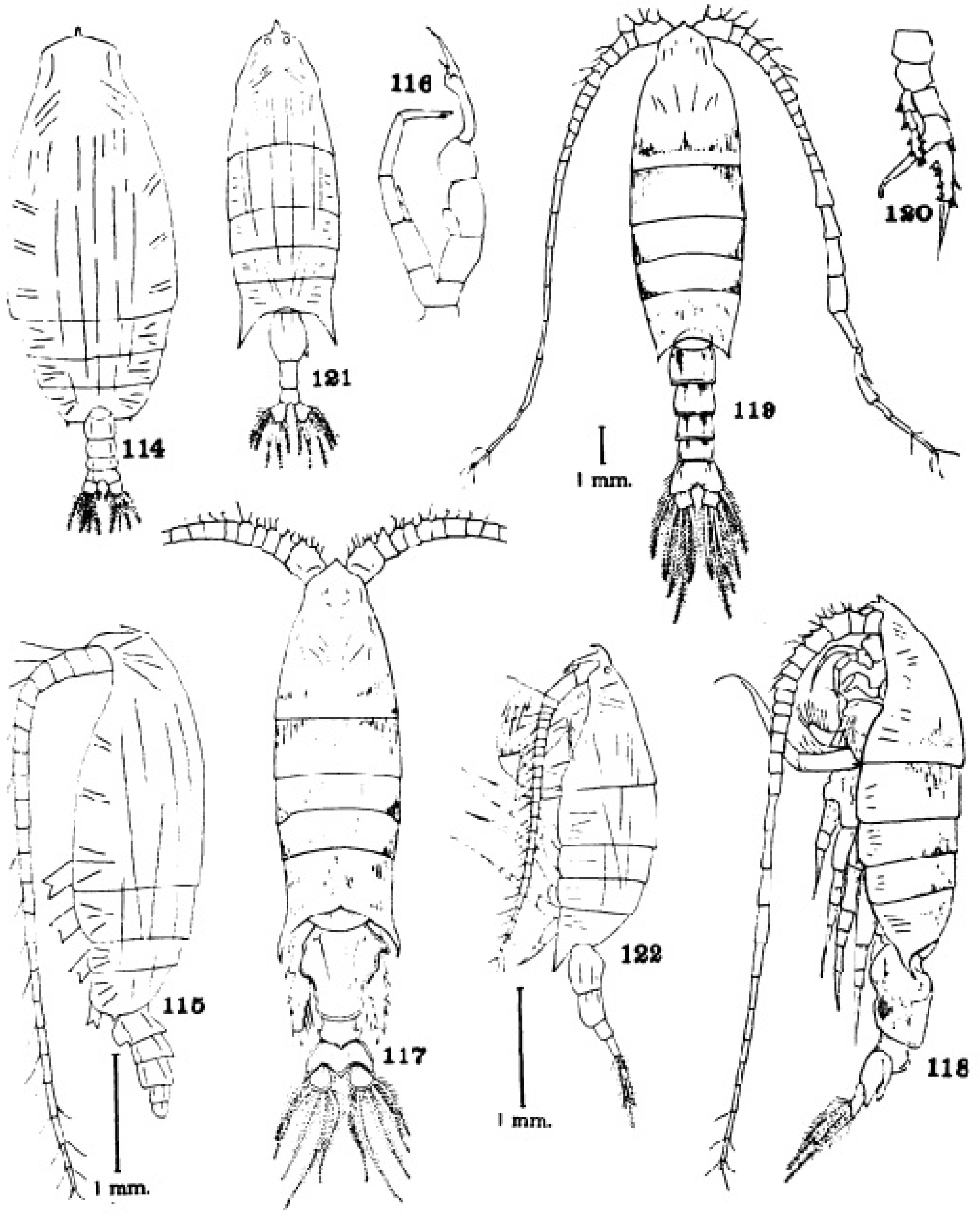
SPECIES OF EUCHIRELLA, ARIETELLUS, AND GAETANUS.

101–106, *Euchirella grandicornis*, new species: 101, Dorsal view, female; 102, dorsal view, male; 103, lateral view, female; 104, second maxilla, female; 105, maxilliped, female; 106, fifth legs, male.

107, *Arietellus giesbrechti* Sars, female: Fifth legs.

108–113, *Gaetanus curvispinus*, new species: 108, Dorsal view, female; 109, lateral view, female; 110, basipod of fourth leg, female; 111, fifth legs, immature male; 112, fifth legs, adult male; 113, rostral horn, adult male.

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SPECIES OF GAETANUS, GAUSSIA, HETERORHABDUS, AND LABIDOCERA.

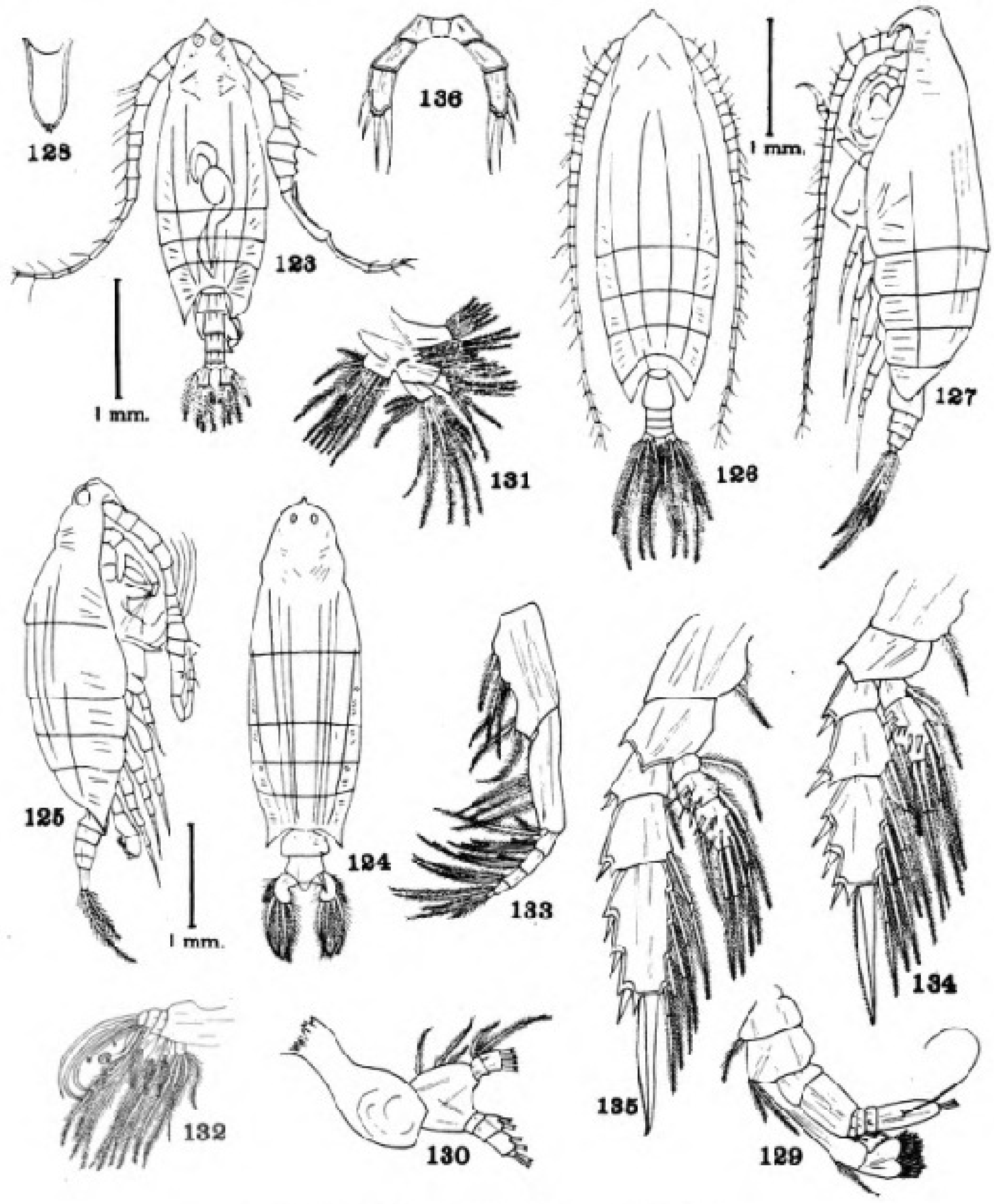
114–116, *Gaetanus microcanthus*, new species: 114, Dorsal view, female; 115, lateral view, female; 116, fifth legs, male.

117–119, *Gaussia princeps* (T. Scott): 117, Dorsal view, female; 118, lateral view, female; 119, dorsal view, male.

120, *Heterorhabdus clausii* (Giesbrecht), female: Fifth leg.

121–122, *Labidocera acuta* (Dana), female: 121, Dorsal view; 122, lateral view.

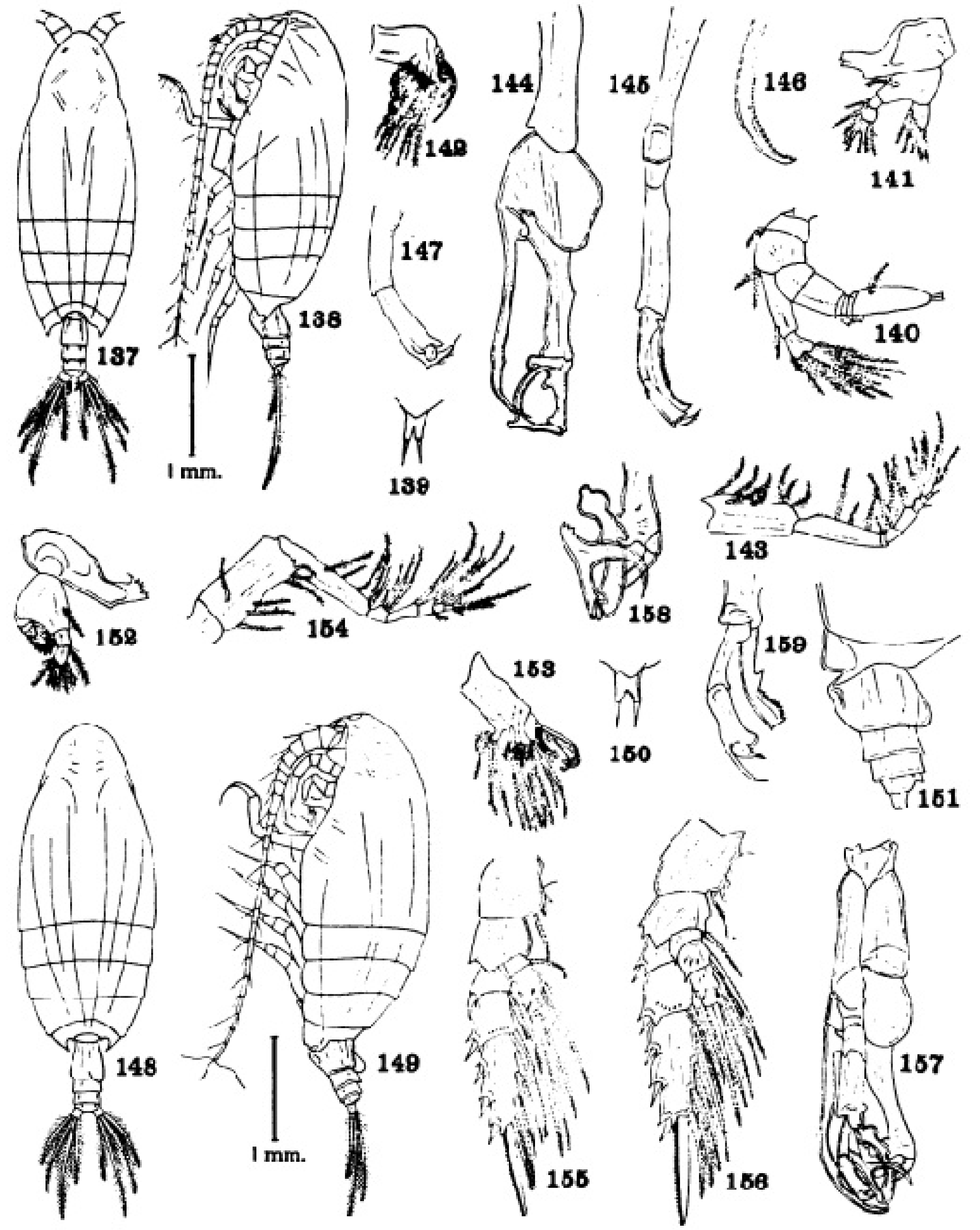
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SPECIES OF LABIDOCERA AND LOPHOTHRIX.

123, *Labidocera acuta* (Dana) male: Dorsal view.
124, 125, *Labidocera acutifrons* (Dana): 124, Dorsal view, female; 125, dorsal view, male.
126–136, *Lophothrix sarsi*, new species, female: 126, Dorsal view; 127, lateral view; 128, rostrum; 129, second antenna; 130, mandible; 131, fisrt maxilla; 132, second maxilla; 133, maxilliped; 134, second leg; 135, third leg; 136, fifth legs.

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SPECIES OF MACANDREWELLA.

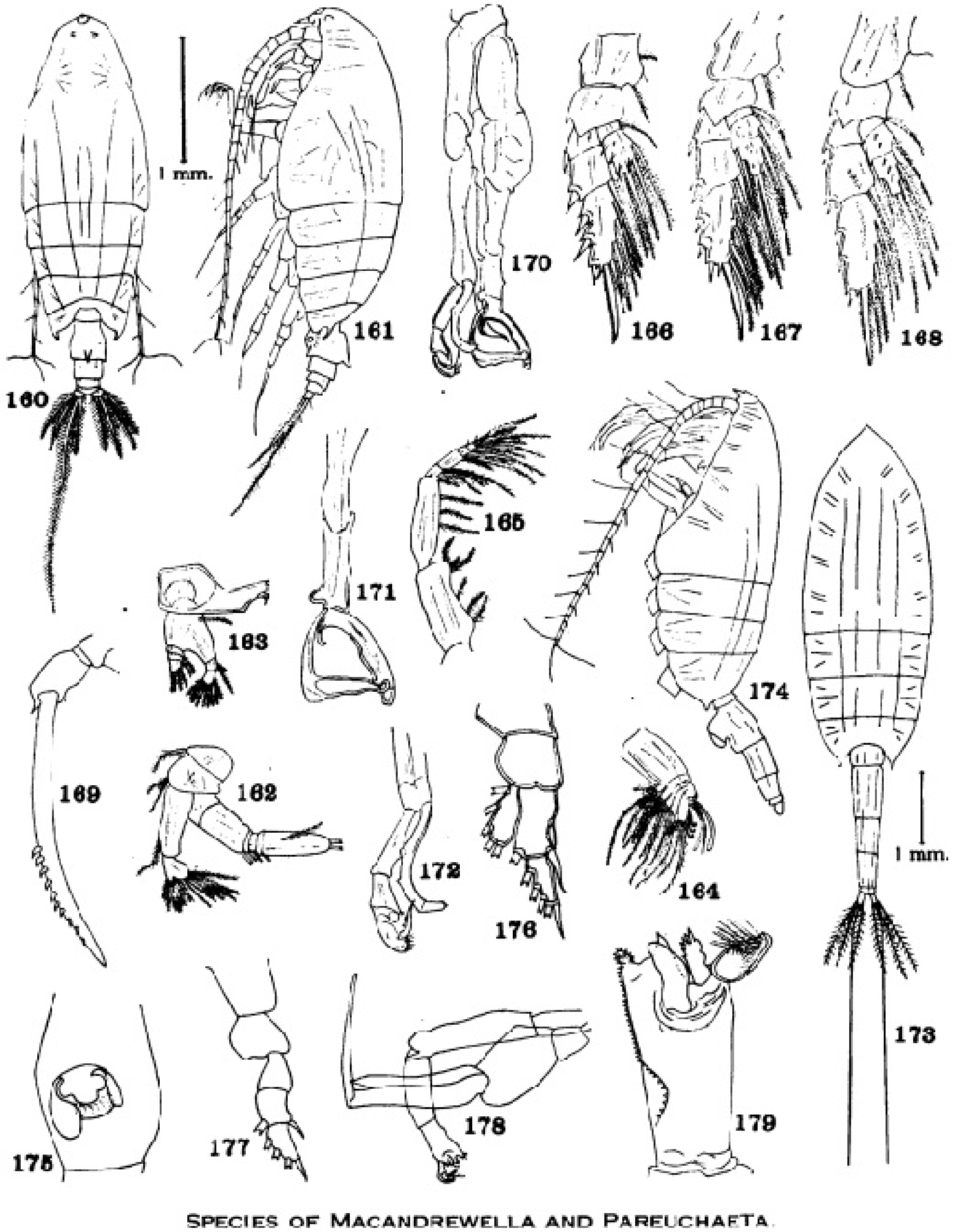
137–143, *Macandrewella chelipes* (Giesbrecht), female: 137, Dorsal view; 138, lateral view; 139, rostrum; 140, second antenna; 141, mandible; 142, second maxilla; 143, maxilliped.

144–147, *Macandrewella chelipes* (Giesbrecht), male: 144, Right fifth leg; 145, left fifth leg 146, endopod of left fifth leg; 147, exopod of left fifth leg.

148–156, *Macandrewella sewelli* Farran, female: 148, Dorsal view; 149, lateral view; 150, rostrum; 151, urosome, lateral view; 152, mandible; 153, second maxilla; 154, maxilliped; 155, second legs; 156, third legs.

157–159, *Macandrewella sewelli* Farran, male: 157, Fifth legs; 158, right fifth leg, distal view; 159, left fifth leg, distal view.

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SPECIES OF MACANDREWELLA AND PAREUCHAETA.

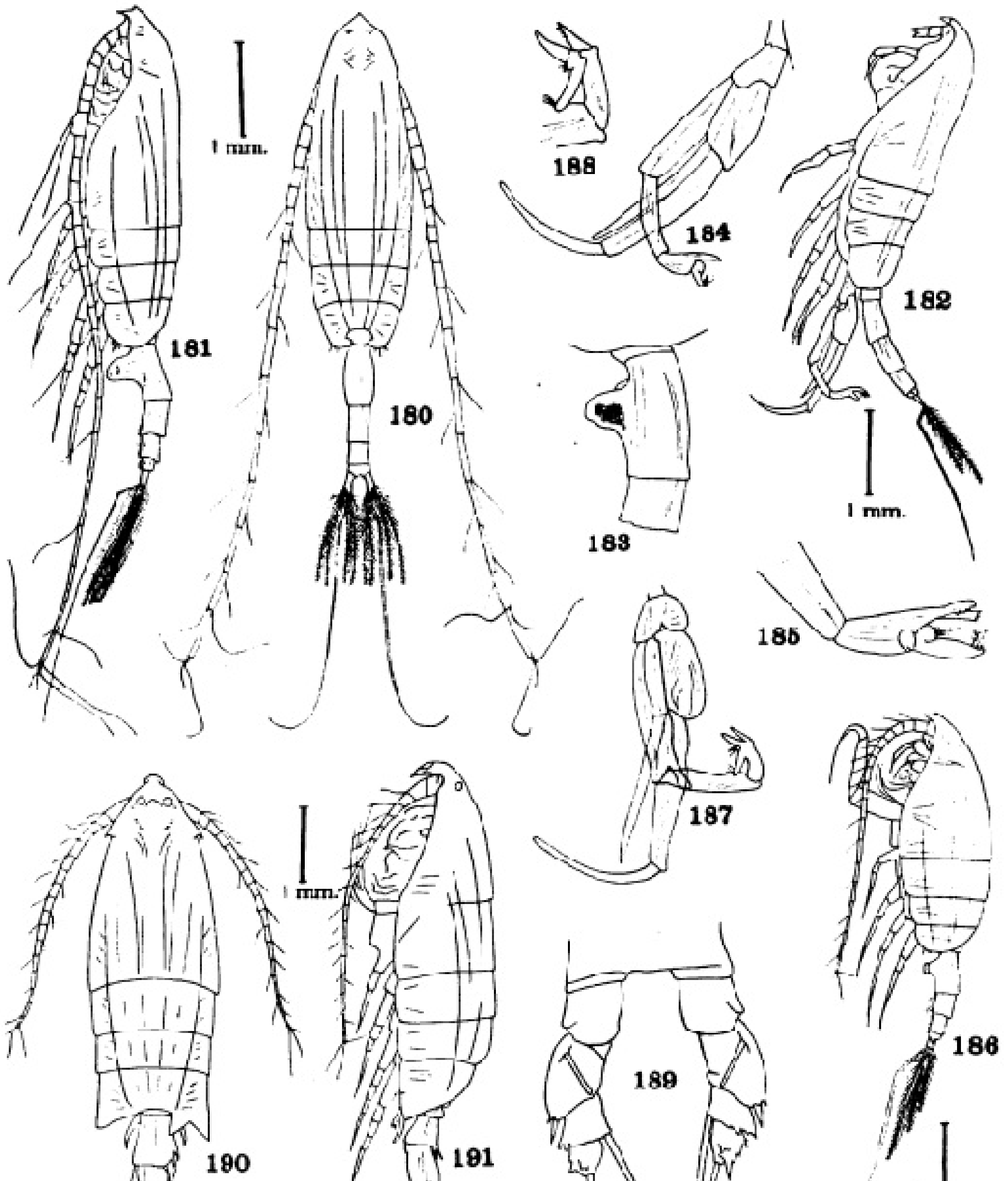
160–169, *Macandrewella agassizi*, new species, female: 160, Dorsal view; 161, lateral view; 162, second antenna; 163, mandible; 164, second maxilla; 165, maxilliped; 166, second leg; 167, third leg; 168, fourth leg; 169, fifth leg.

170–172, *Macandrewella agassizi*, new species, male: 170, Fifth leg; 171, distal portion of exopod of right fifth leg; 172, distal portion of left fifth leg.

173–176, *Pareuchaeta erebi* Farran, female: 173, Dorsal view; 174, lateral view; 175, ventral protuberance of genital segment; 176, first leg.

177–179, *Pareuchaeta erebi* Farran, male: 177, Basipod and exopod of first leg; 178, fifth legs; 179, terminal armature of exopod of left fifth leg.

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SPECIES OF PAREUCHAETA, PHYLLOPUS, AND PONTELLA.

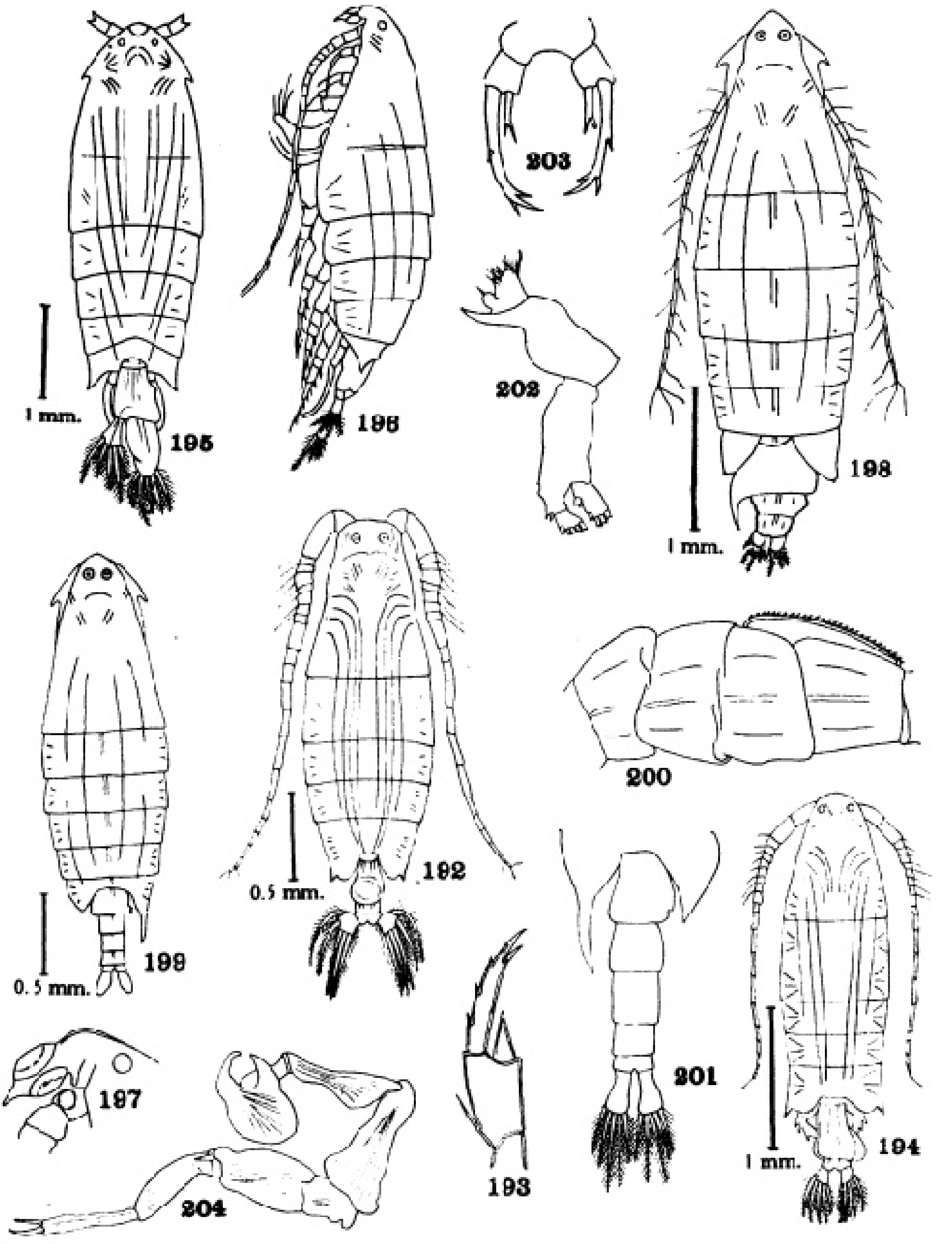
180–185, *Pareuchaeta grandiremis* (Giesbrecht): 180, Dorsal view, female; 181, lateral view, female; 182, lateral view, male; 183, genital segment, lateral view, female; 184, fifth legs, male; 185, terminal armature of exopod of left fifth leg, male.

186–188, *Pareuchaeta rasa* Farran: 186, Lateral view, female; 187, fifth legs, male; 188, terminal armature of exopod of left fifth leg, male.

189, *Phyllopus muticus* Sars, female: Fifth legs.

190, 191, *Pontella atlantica* (Milne Edwards), female: 190, Dorsal view; 191, lateral view.

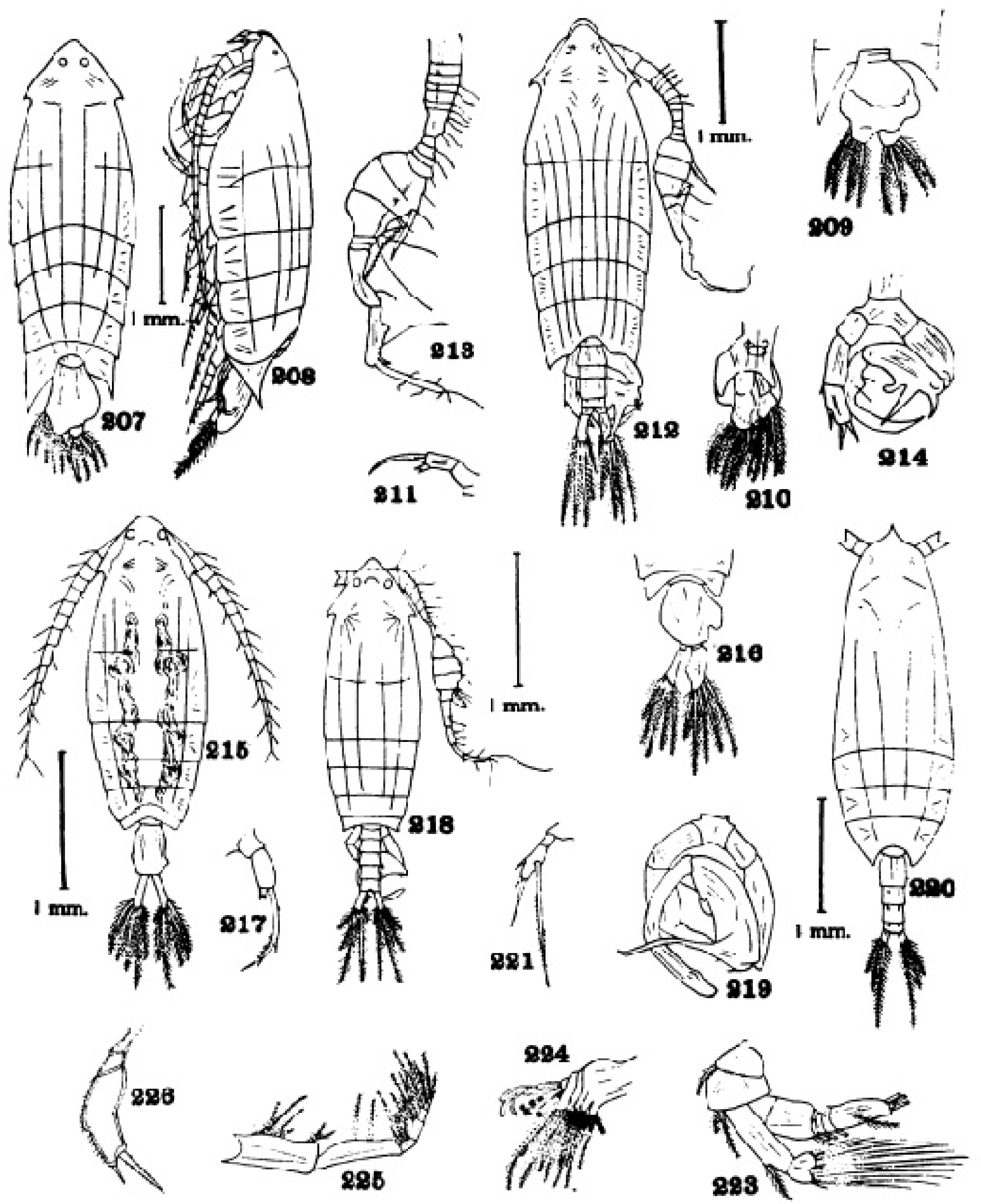
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SPECIES OF LABIDOCERA AND PONTELLA.

192, 193, *Labidocera detruncata* (Dana), female: 192, Dorsal view; 193, fifth leg.
194, *Labidocera nerii* (Krøyer), female: Dorsal view.
195–197, *Pontella danae* (Giesbrecht), female: 195, Dorsal view; 196, lateral view; 197, rostrum.
198–204, *Pontella pulvinata*, new species: 198, Dorsal view, female; 199, dorsal view, male; 200, middle segments of right first antenna, male; 201, urosome, male; 202, mandible, female; 203, fifth legs, female; 204, fifth legs, male.

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SPECIES OF PONTELLA AND SCAPHOCALANUS.

207–211, *Pontella securifer* Brady, female: 207, Dorsal view; 208, lateral view; 209, urosome, dorsal view; 210, urosome, ventral view; 211, fifth leg.

212–214, *Pontella securifer* Brady, male: 212, Dorsal view; 213, right first antenna; 214, fifth legs.

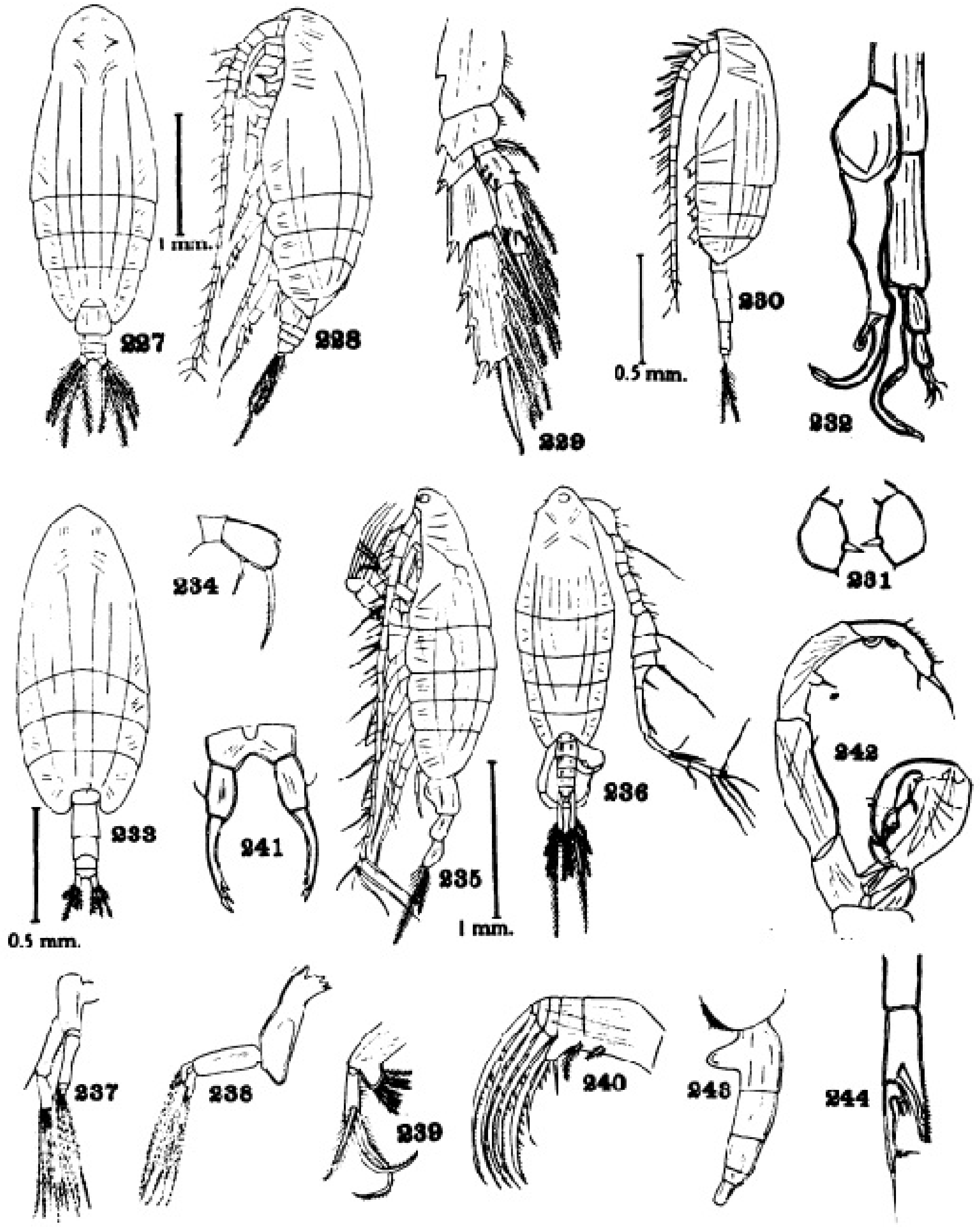
215–217, *Pontella tenuiremis* Giesbrecht, female: 215, Dorsal view; 216, urosome, dorsal view; 217, fifth leg.

218, 219, *Pontella tenuiremis* Giesbrecht, male: 218, Dorsal view; 219, fifth legs.

220, 221, *Scaphocalanus affinis* (Sars), female: 220, Dorsal view; 221, fifth leg.

223–226, *Scaphocalanus robustus* (T. Scott), female: 223, Second antenna; 224, second maxilla; 225, maxilliped; 226, fifth leg.

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SPECIES OF SCAPHOCALANUS, SCOLECITHRICELLA, TORTANUS, AND EUCHAETA.

227–229, *Scaphocalanus robustus* (T. Scott), female: 227, Dorsal view; 228, lateral view; 229, third leg.

230–232, *Scolecithricella dentata* (Giesbrecht): 230, Lateral view, male (fifth legs amputated); 231, fifth legs, female; 232, fifth legs, male.

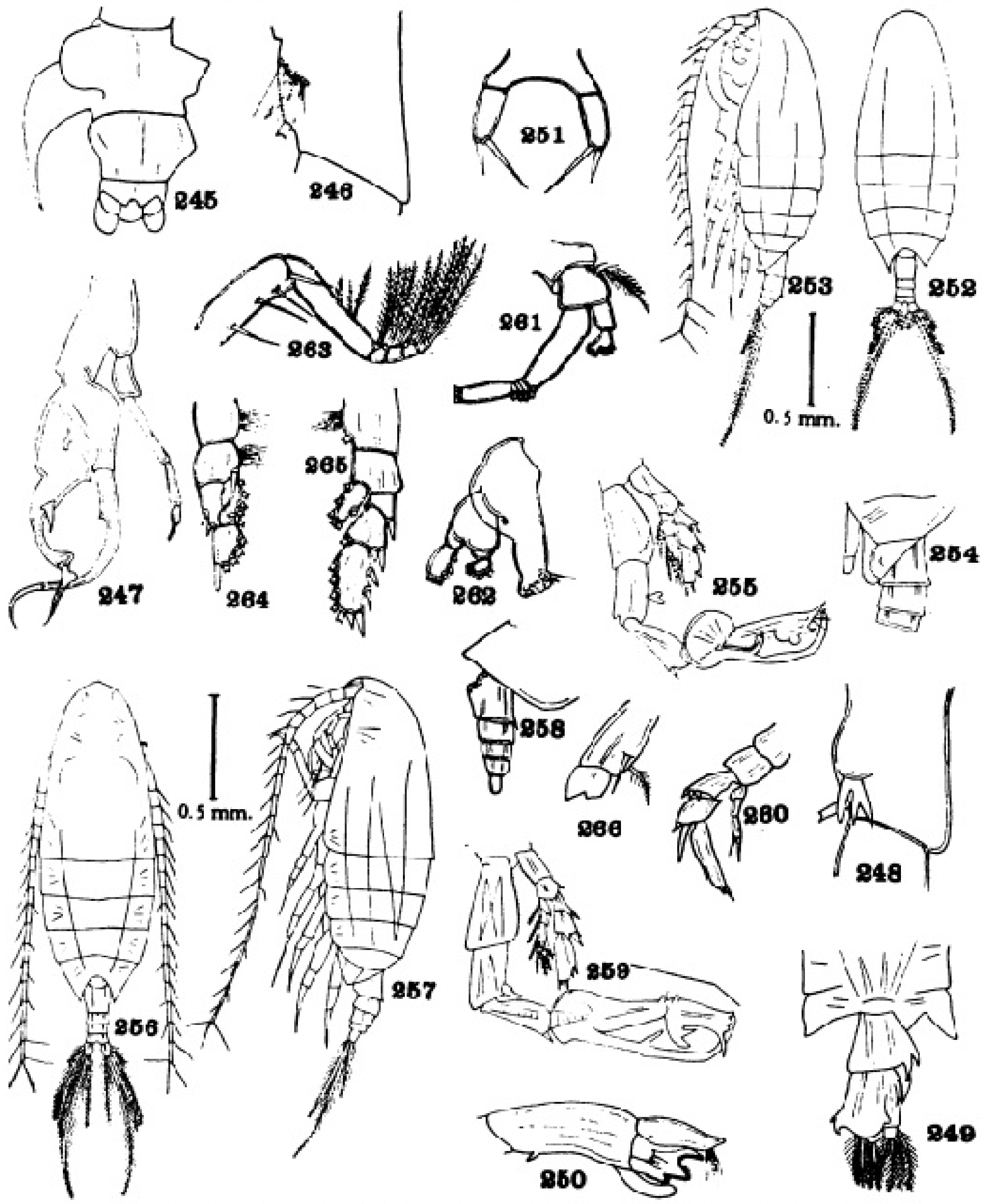
233, 234, *Scolecithricella vittata* (Giesbrecht), female: 233, Dorsal view; 234, fifth leg.

235, 237–241, *Tortanus murrayi* A. Scott, female: 235, Dorsal view; 237, second antenna; 238, mandible; 239, first maxilla; 240, second maxilla; 241, fifth legs.

236, 242, *Tortanus murrayi* A. Scott, male: 236, Dorsal view; 242, fifth legs.

243, 244, *Euchaeta spinosa* Giesbrecht: 243, Urosome, lateral view, female; 244 distal, portion of left fifth leg, male.

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SPECIES OF PONTELLA, GAETANUS, EUCHIRELLA, PAREUCHAETA, SCOLECITHRICELLA, AND UNDINULA.

245, *Pontella pulvinata*, new species, female: Urosome, dorsal view.

246, *Gaetanus microcanthus*, new species, female: Basipod of fourth leg.

247, 248, *Euchirella bella* Giesbrecht: 247, Fifth legs, male; 248, basipod of fourth leg, female.

249, *Pontella atlantica* (Milne Edwards), female: Urosome, dorsal view.

250, *Pareuchaeta sarsi* (Farran), male: Distal portion of exopod of left fifth leg.

251, *Scolecithricella auropecten* (Giesbrecht), female: Fifth legs.

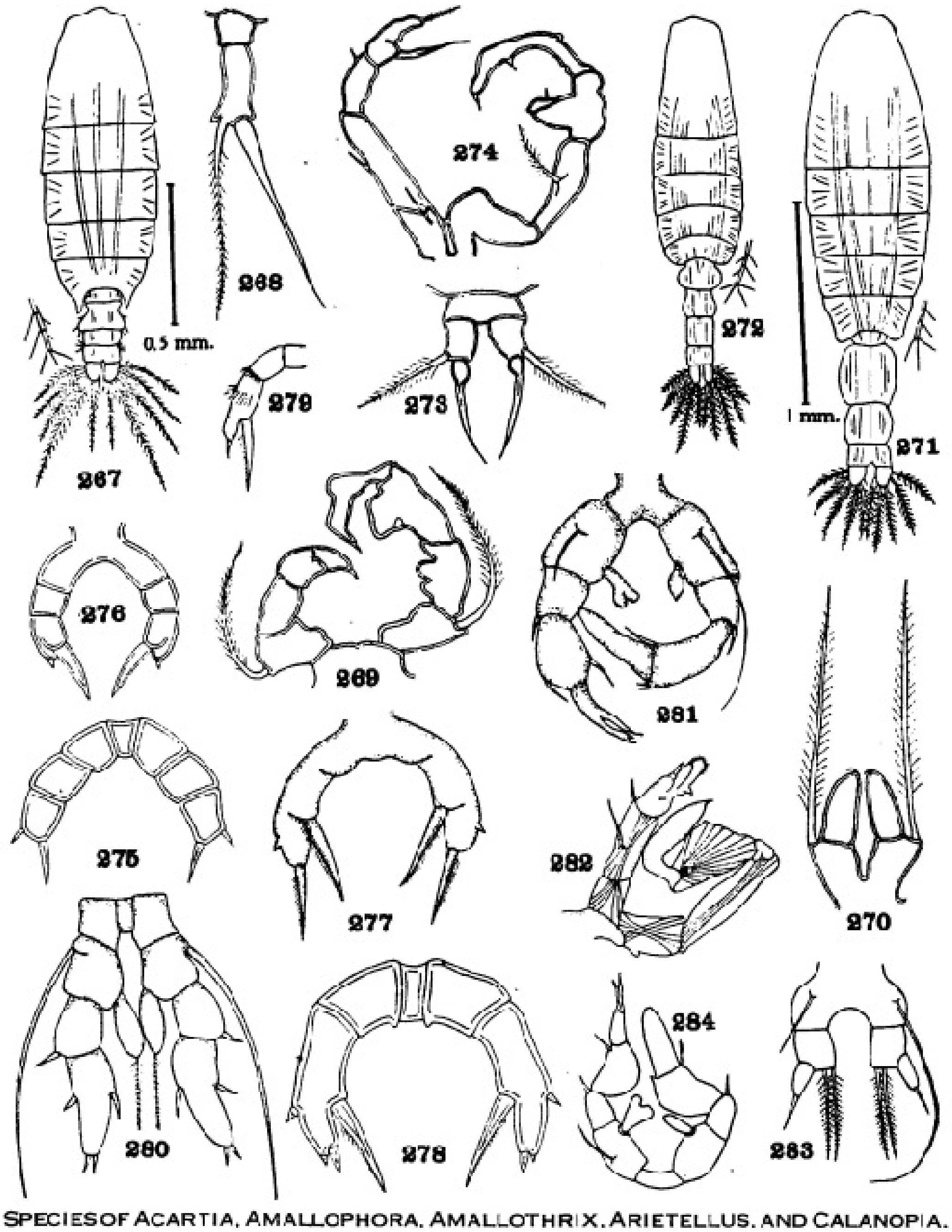
252–255, *Undinula caroli* (Giesbrecht); 252, Dorsal view, female; 253, lateral view, female; 254, urosome, lateral view, female; 255, fifth legs, male.

256–259, *Undinula darwinii* (Lubbock): 256, Dorsal view, female; 257, lateral view, female; 258, urosome, lateral view, female; 259, fifth legs, male.

260, *Undinula vulgaris* (Dana), male: Right fifth leg.

261–265, *Euchirella bella* Giesbrecht, female: 261, Second antenna; 262, mandible; 263, maxilliped; 264, first leg, 265, second leg.

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SPECIES OF ACARTIA, AMALLOPHORA, AMALLOTHRIX, ARIETELLUS, AND CALANOPIA.

267–269, *Acartia laxa* Dana: 267, Dorsal view, male; 268, fifth leg, female; 269, fifth leg, male.

271–274, *Acartia tumida* Willey: 271, Dorsal view, female; 272, dorsal view, male; 273, fifth legs, female; 274, fifth legs, male.

275, *Amallophora typica* T. Scott, female: Fifth legs.

276, *Amallothrix emarginata* (Farran), female: Fifth legs.

277, *Amallothrix falcifer* (Farran), female: Fifth legs.

278, *Amallothrix lobata* (Sars), female: Fifth legs.

279, *Amallothrix propinqua* (Sars), female: Fifth legs.

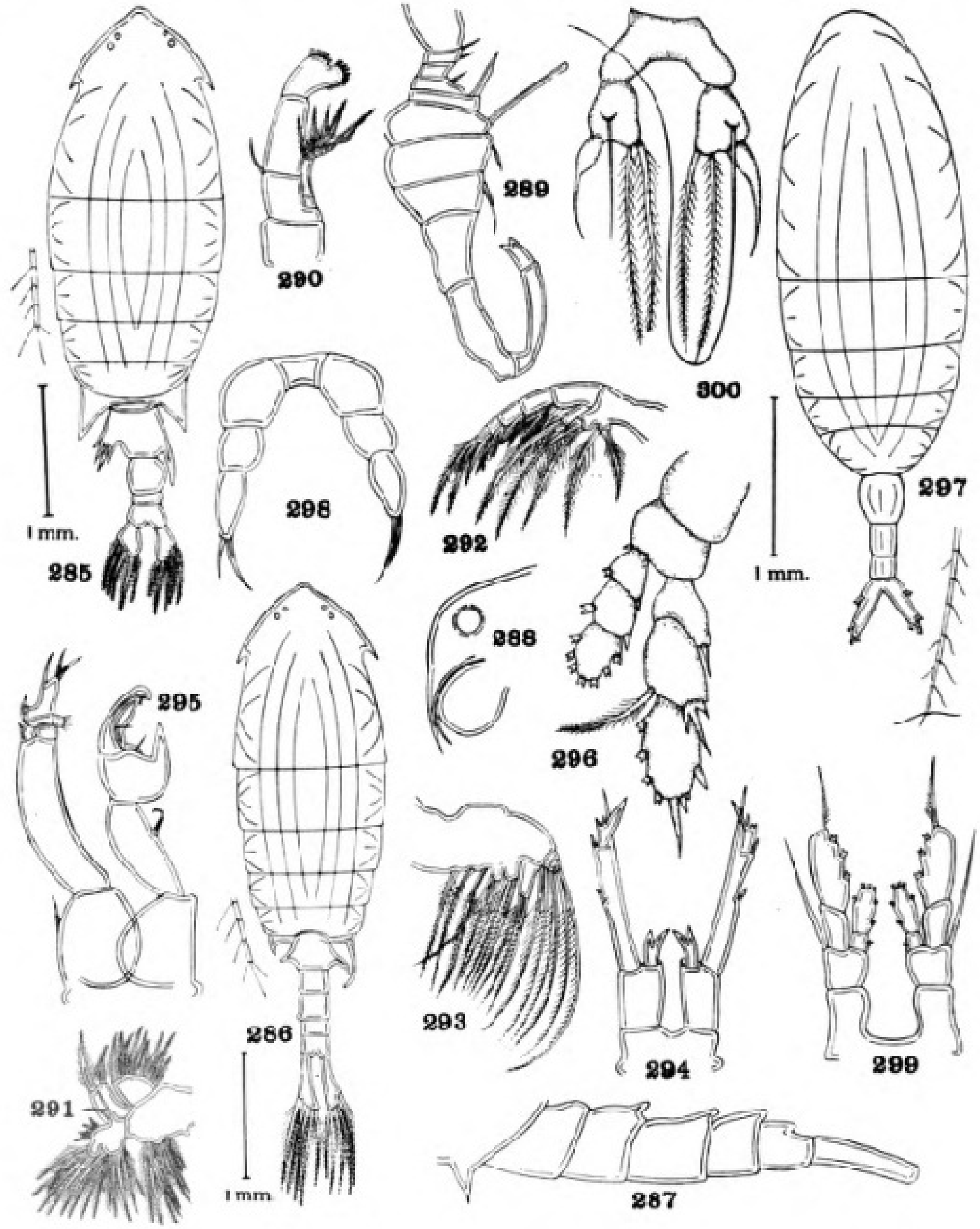
280, *Arietellus aculeatus* (T. Scott), male: Fifth legs.

281, *Arietellus plumifer* Sars, male; Fifth legs.

282, *Calanopia thompsoni* A. Scott, male: Fifth legs.

283, 284, *Arietellus setosus* Giesbrecht; 283, Fifth legs, female; 284, fifth legs, male.

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SPECIES OF ANOMALOCERA, DISSETA, EUAUGAPTILUS, FARRANIA, AND ARIETELLUS.

285, 288, 290–294, *Anomalocera ornata* Sutcliffe, female: 285, Dorsal view; 288, rostrum; 290, second antenna; 291, first maxilla; 292, maxilliped; 293, second maxilla; 294, fifth legs.

286, 287, 289, 295, *Anomalocera ornata* Sutcliffe, male: 286, Dorsal view; 287, urosome, lateral view; 289, right first antenna; 295, fifth legs.

296, *Disseta palumboi* Giesbrecht, female: Fifth leg.

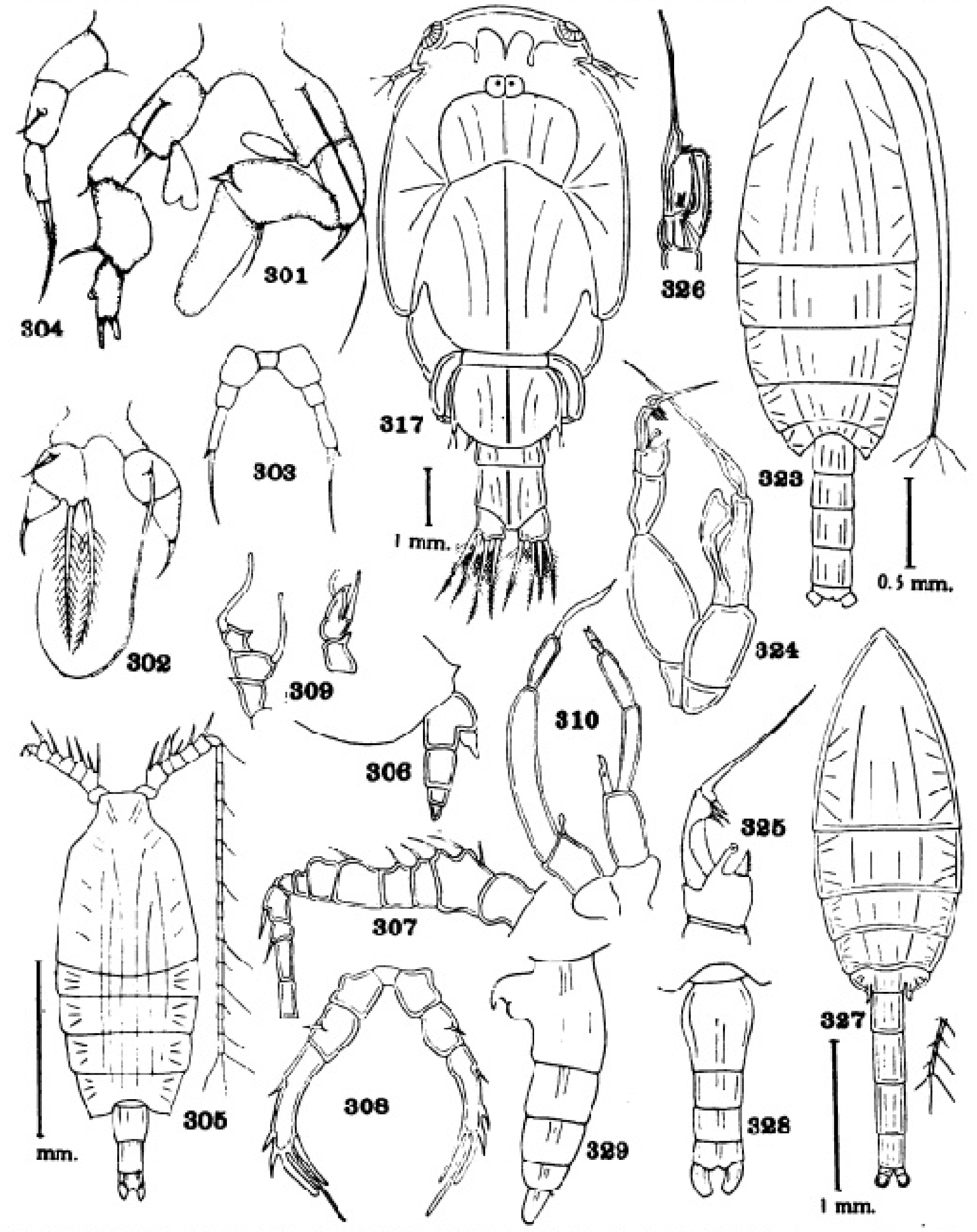
297, *Euaugaptilus hecticus* (Giesbrecht), female: Dorsal view.

298, *Farrania frigidus* (Wolfenden), female: Fifth legs.

299, *Euaugaptilus hecticus* (Giesbrecht), female: Fifth legs.

300, *Arietellus simplex* Sars, female: Fifth legs.

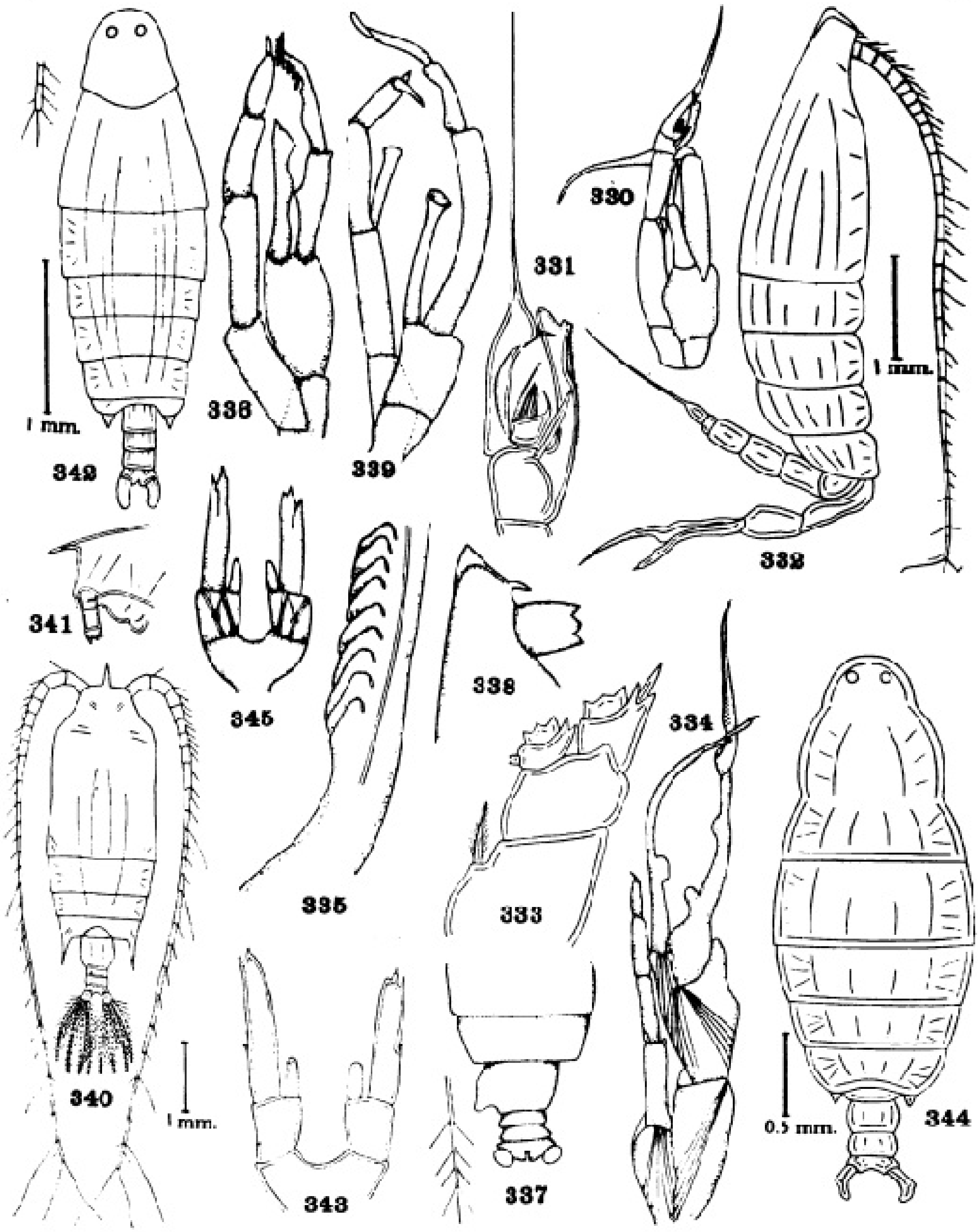
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SPECIES OF ARIETELLUS, BATHYPONTIA, CALANOPIA, CANDACIA, CENTROPAGES, CHIRIDIUS, CALIGUS, AND EUCHAETA.

301, 302, *Arietellus simplex* Sars: 301, Fifth legs, male; 302, malformed fifth legs, female.
303, *Bathypontia minor* Sars, female; Fifth legs.
304, *Calanopia minor* A. Scott, female: Fifth leg.
305–308, *Candacia turgida*, new species, female: 305, Dorsal view; 306, urosome, lateral view; 307, basal segments of first antenna; 308, fifth legs.
309, *Centropages gracilis* (Dana), male: Fifth legs.
310, *Chiridius armatus* (Boeck), male: Fifth legs.
317, *Caligus thymni* Dana, male: Dorsal view.
323–325, *Euchaeta media* Giesbrecht, male: 323, Dorsal view; 324, fifth legs; 325, distal portion of left fifth leg.
326, *Euchaeta concinna* Dana, male: Terminal portion of left fifth leg.
327–329, *Euchaeta pubera* Sars: 327, Dorsal view, male; 328, urosome, dorsal view, female; 329, urosome, lateral view, female.

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SPECIES OF EUCHAETA, EUCHIRELLA, GAETANUS, AND LABIDOCERA.

330, 331, *Euchaeta pubera* Sars, male: 330, fifth legs; 331; distal portion of exopod of left fifth leg.

332–335, *Euchirella bitumida* With, male: 332, Lateral view; 333, basal portion of fourth leg; 334. fifth legs; 335, portion of end segment of exopod of right fifth leg.

336, *Euchirella curticauda* Giesbrecht, male: Fifth legs.

337, *Euchirella galeata* Giesbrecht, female: Urosome, dorsal view.

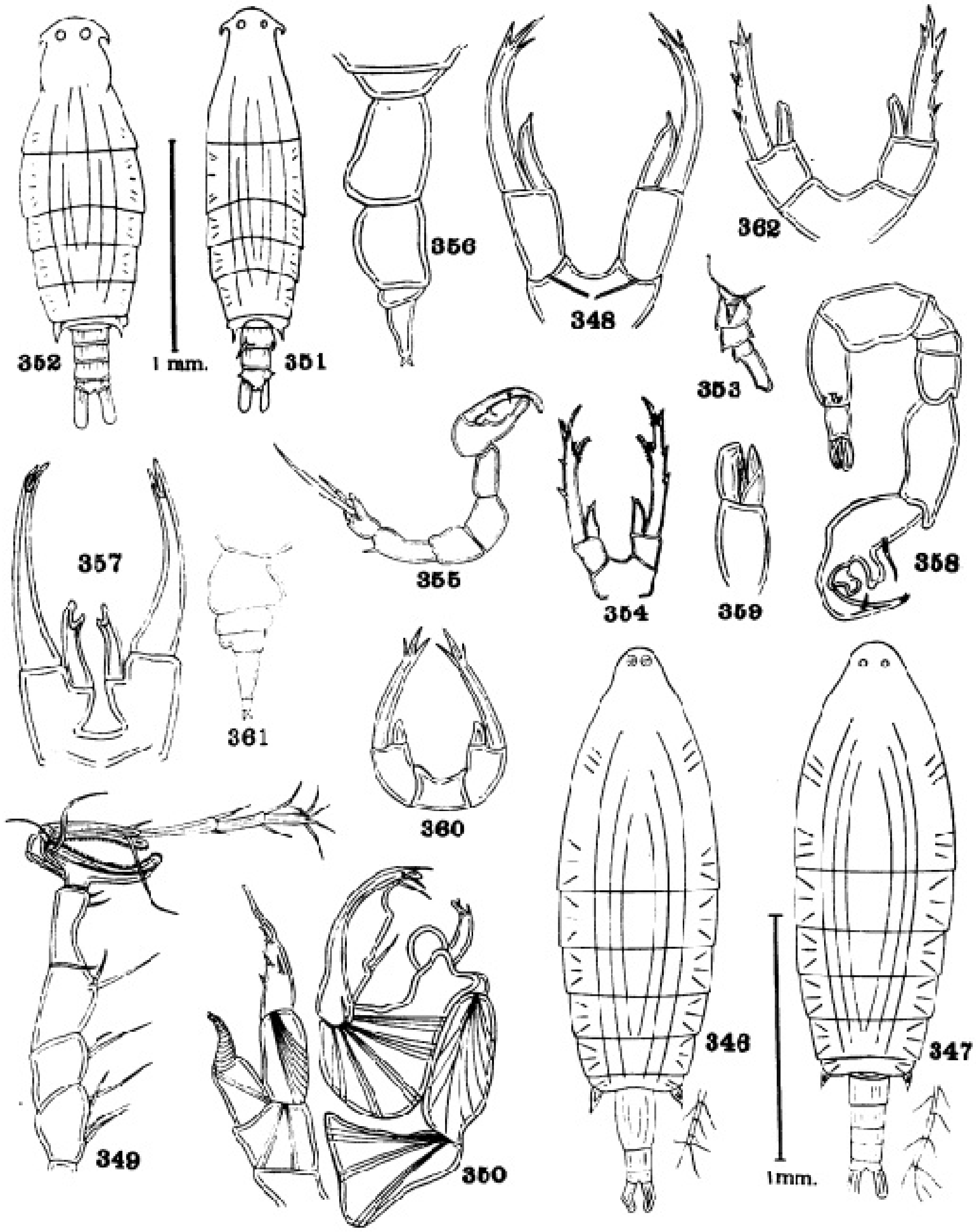
338, 339, *Euchirella maxima* Wolfenden: 338, Crest and rostrum, lateral view, female; fifth legs, male.

340, 341, *Gaetanus recticornis* Wolfenden, female: 340, Dorsal view; 341, rostrum, lateral view.

342, 343, *Labidocera agilis* (Dana), female: 342, Dorsal view; 343, fifth legs.

344, 345, *Labidocera albatrossi*, new species, female: 344, Dorsal view; 345, fifth legs.

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SPECIES OF LABIDOCERA.

346–350, *Labidocera insolita*, new species: 346, Dorsal view, female; 347, dorsal view, male; 348, fifth legs, female; 349, right first antenna, male; 350, fifth legs, male.

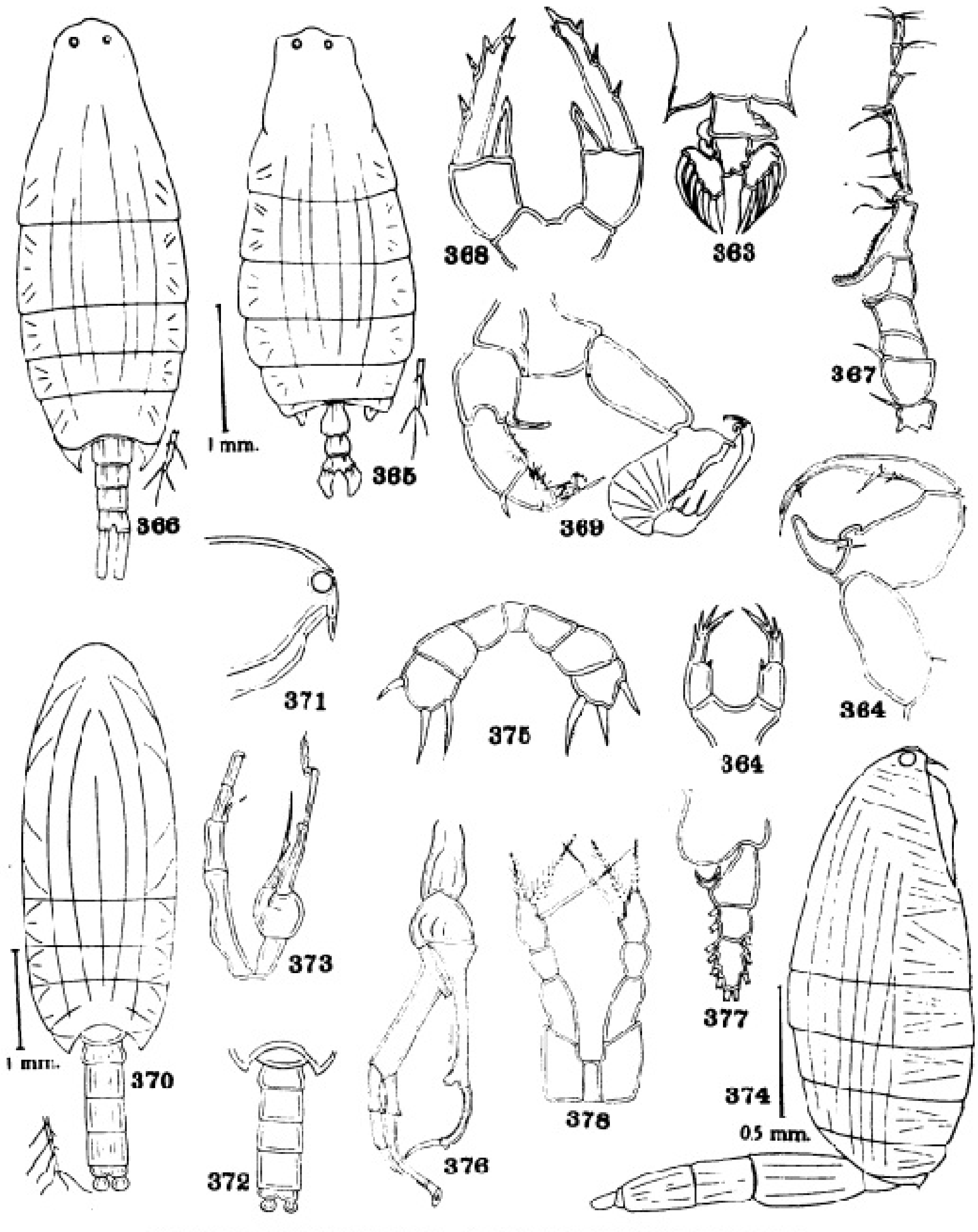
351–355, *Labidocera laevidentata* (Brady): 351, Dorsal view, female; 352, dorsal view, male; 353, urosome, lateral view, female; 354, fifth legs, female; 355, fifth legs, male.

356–359, *Labidocera minuta* Giesbrecht: 356, Urosome, lateral view, female; 357, fifth legs, female; 358, fifth legs, male; 359, tip of left fifth leg, male.

360, *Labidocera nerii* Krøyer, female: Fifth legs.

361, 362, *Labidocera orsinii* Giesbrecht, female: 361, Urosome, lateral view; 362, fifth legs.

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SPECIES OF LABIDOCERA, LOPHOTHRIX, AND METRIDIA.

363, *Labidocera pavo* Giesbrecht, female: Urosome, dorsal view.

364,364′, *Labidocera euchaeta* Giesbrecht: 364, Right fifth leg, male; 364′, fifth legs, female.

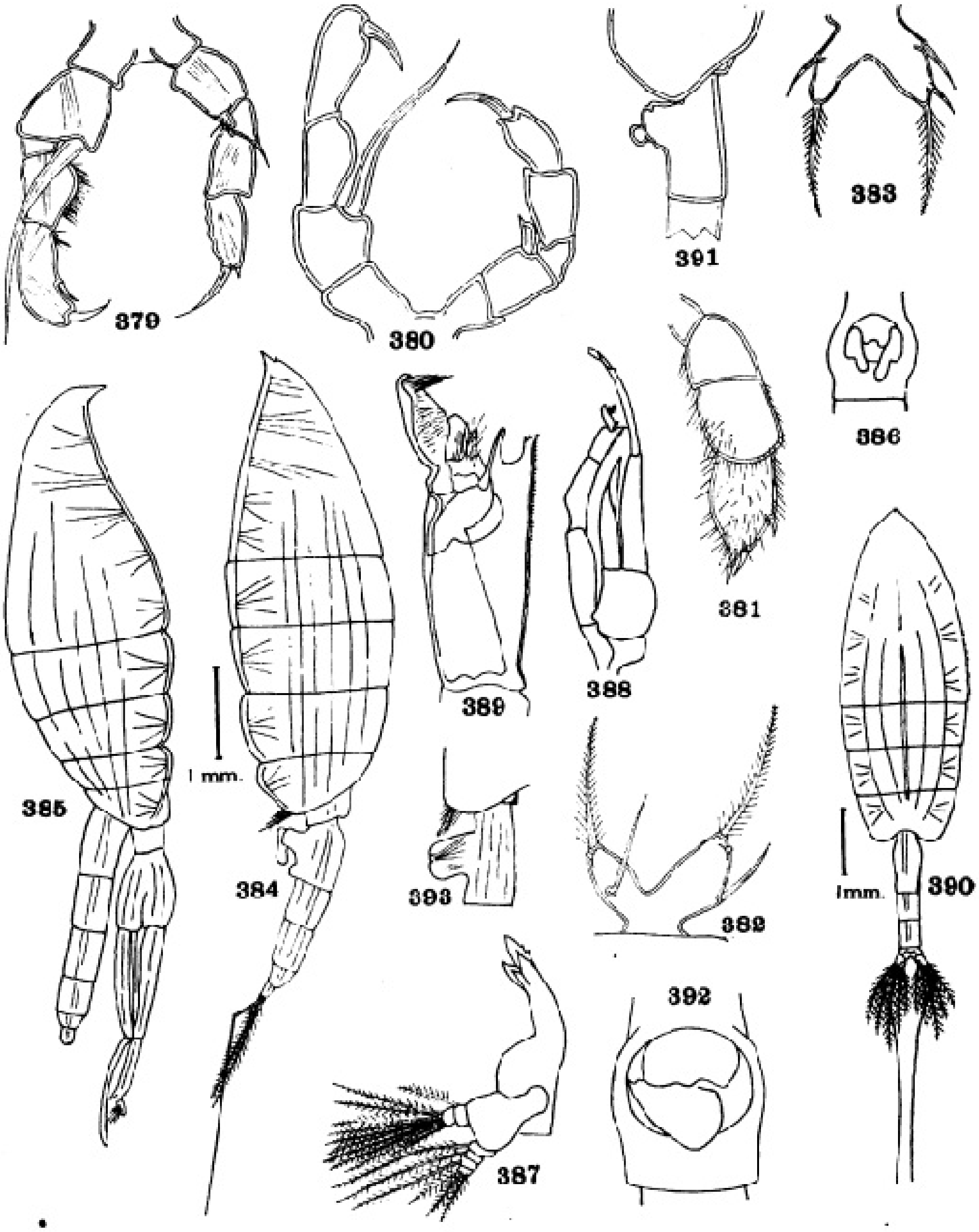
365–369, *Labidocera tenuicauda*, new species: 365, Dorsal view, female; 366, dorsal view, male; 367, right first antenna, male; 368, fifth legs, female; 369, fifth legs, male.

370–373, *Lophothrix humilifrons* Sars, male: 370, Dorsal view; 371, rostrum, lateral view; 372, urosome, dorsal view; 373, fifth legs.

374–376, *Lophothrix latipes* (T. Scott): 374, Lateral view, male; 375, fifth legs, female; 376, fifth legs, male.

377, 378, *Metridia atra* Esterly, female: 377, Endopod of second leg; 378, fifth legs.

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SPECIES OF MONACILLA, ONCHOCALANUS, PARAUGAPTILUS, AND PAREUCHAETA.

379, *Monacilla semispina* (A. Scott), male: Fifth legs.

380, *Monacilla typica* Sars, male: Fifth legs.

381, *Onchocalanus affinis* With, female: Fifth leg.

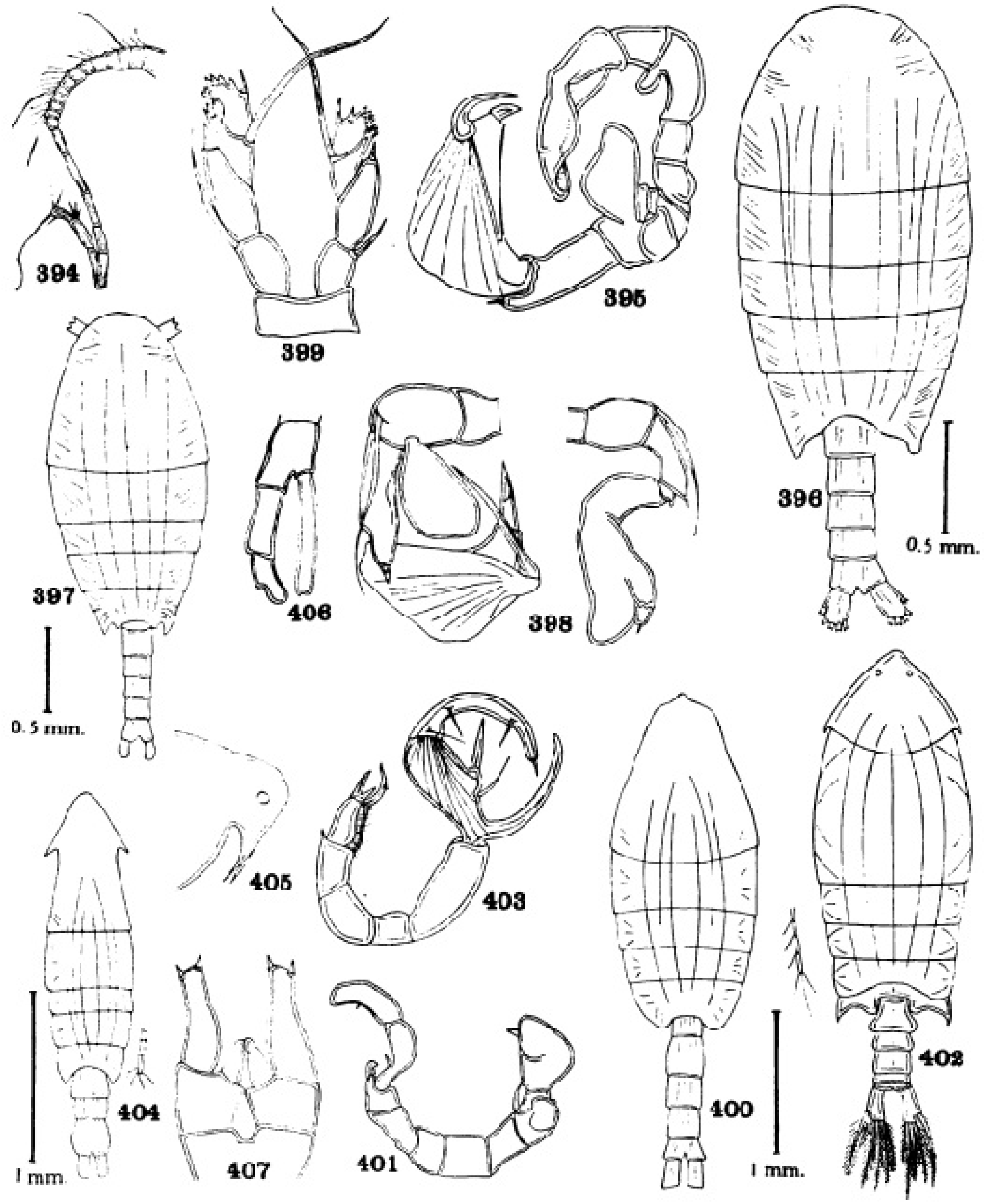
382, 383, *Paraugaptilus buchani* Wolfenden, female: 382, Fifth legs; 383, fifth legs of another specimen.

384–389, *Pareuchaeta californica* (Esterly): 384, Lateral view, female; 385, lateral view, male; 386, genital segment, ventral view, female; 387, mandible, female; 388, fifth legs, male; 389, terminal armature of exopod of left fifth leg, male.

390–392, *Pareuchaeta exigua* (Wolfenden), female: 390, Dorsal view; 391, genital segment, lateral view; 392, genital segment, ventral view.

393, *Pareuchaeta gracilis* (Sars), female: Genital segment, lateral view.

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SPECIES OF PHYLLOPUS, PLEUROMAMMA, AND PONTELLA.

394–396, *Phyllopus aequalis* Sars, male: 394, Left first antenna; 395, fifth legs; 396, dorsal view.

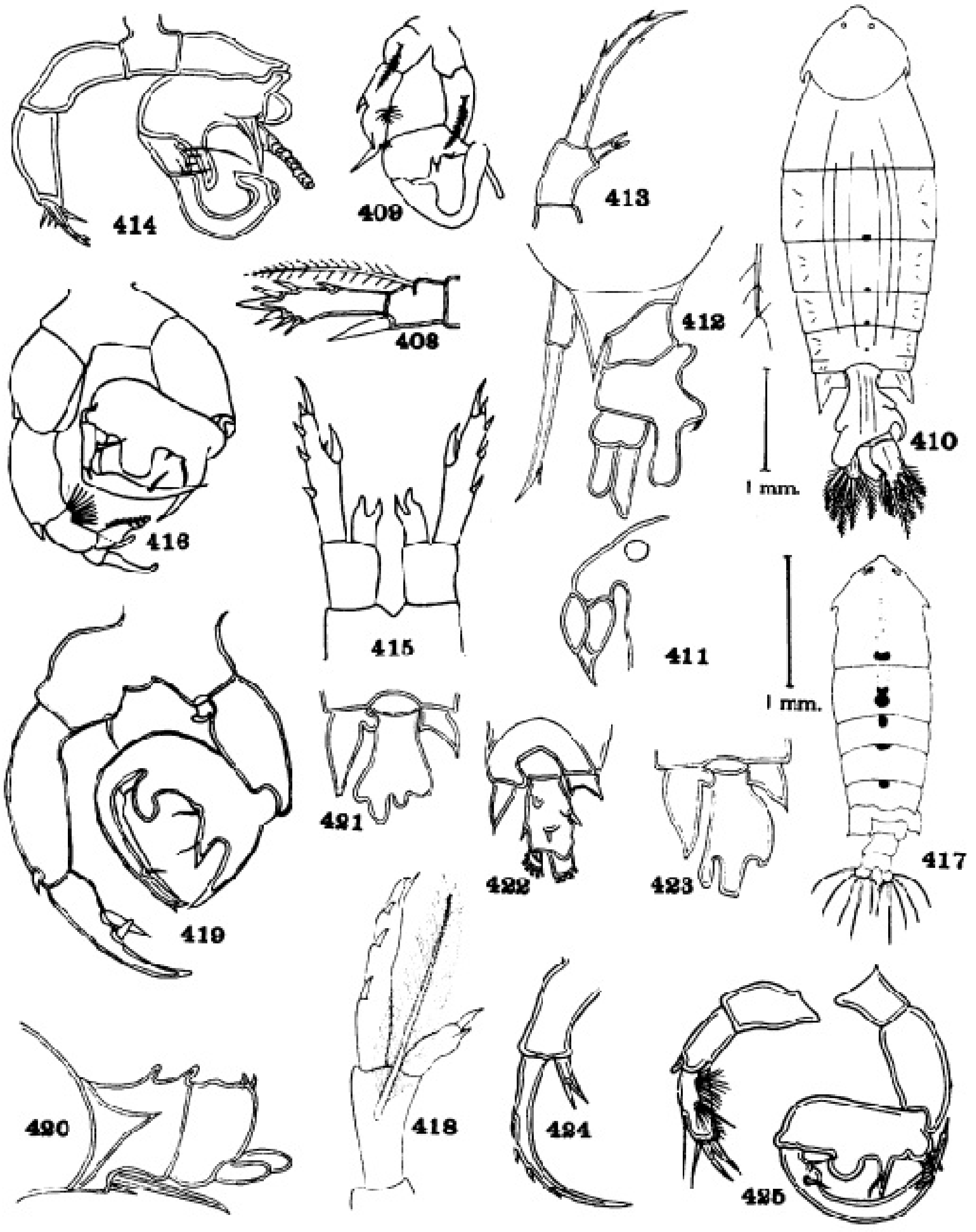
397–399, *Phyllopus giesbrechti* A. Scott: 397, Dorsal view, male; 398, fifth legs, male; 399 fifth legs, female.

400, 401, *Pleuromamma piseki* Farran, male: 400, Dorsal view; 401, fifth legs.

402, 403, *Pontella cerami* A. Scott, male: 402, Dorsal view; 403, fifth legs.

404–407, *Pontella gracilis*, new species, female: 404, Dorsal view; 405, rostrum; 406, second antenna; 407, fifth legs.

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SPECIES OF PONTELLA.

408, 409, *Pontella chierchiae* Giesbrecht: 408, Fifth legs, female; 409, fifth legs, male.

410–413, *Pontella diagonalis*, new species, female: 410 Dorsal view; 411, rostrum; 412, urosome, lateral view; 413, fifth leg.

414, *Pontella fera* Dana, male: Fifth legs.

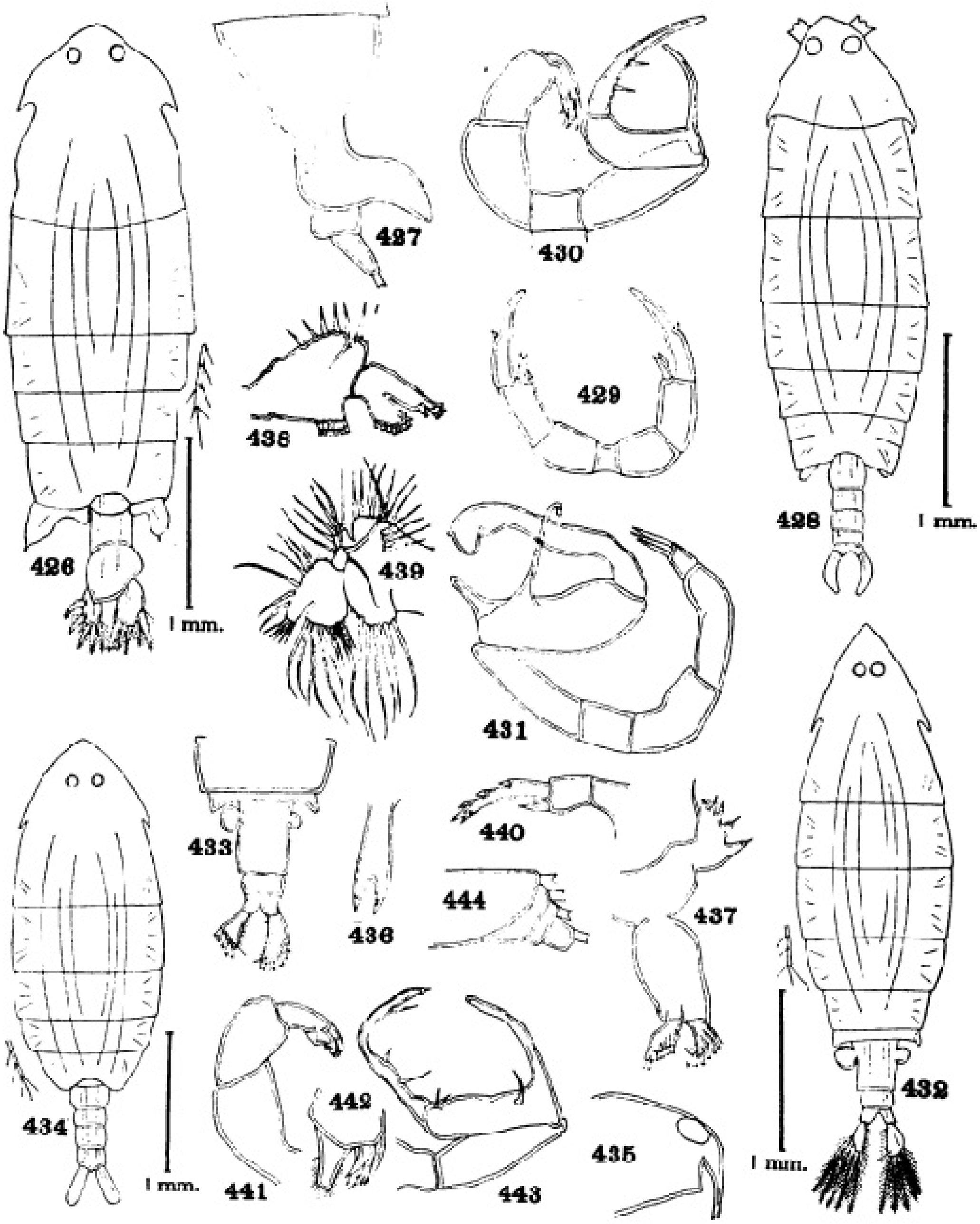
415, 416, *Pontella lobiancoi* (Canu): 415, Fifth legs, female; 416, fifth legs, male.

417–419, *Pontella meadii* Wheeler: 417, Dorsal view, female; 418, fifth legs, female; 419, fifth legs, male.

421–424, *Pontella securifer* Brady, female: 421, Urosome, dorsal view; 422, urosome, dorsal view of another specimen; 423, urosome, dorsal view of another specimen; 424, fifth leg.

425, *Pontella securifer* Brady male; Fifth legs.

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SPECIES OF PONTELLA.

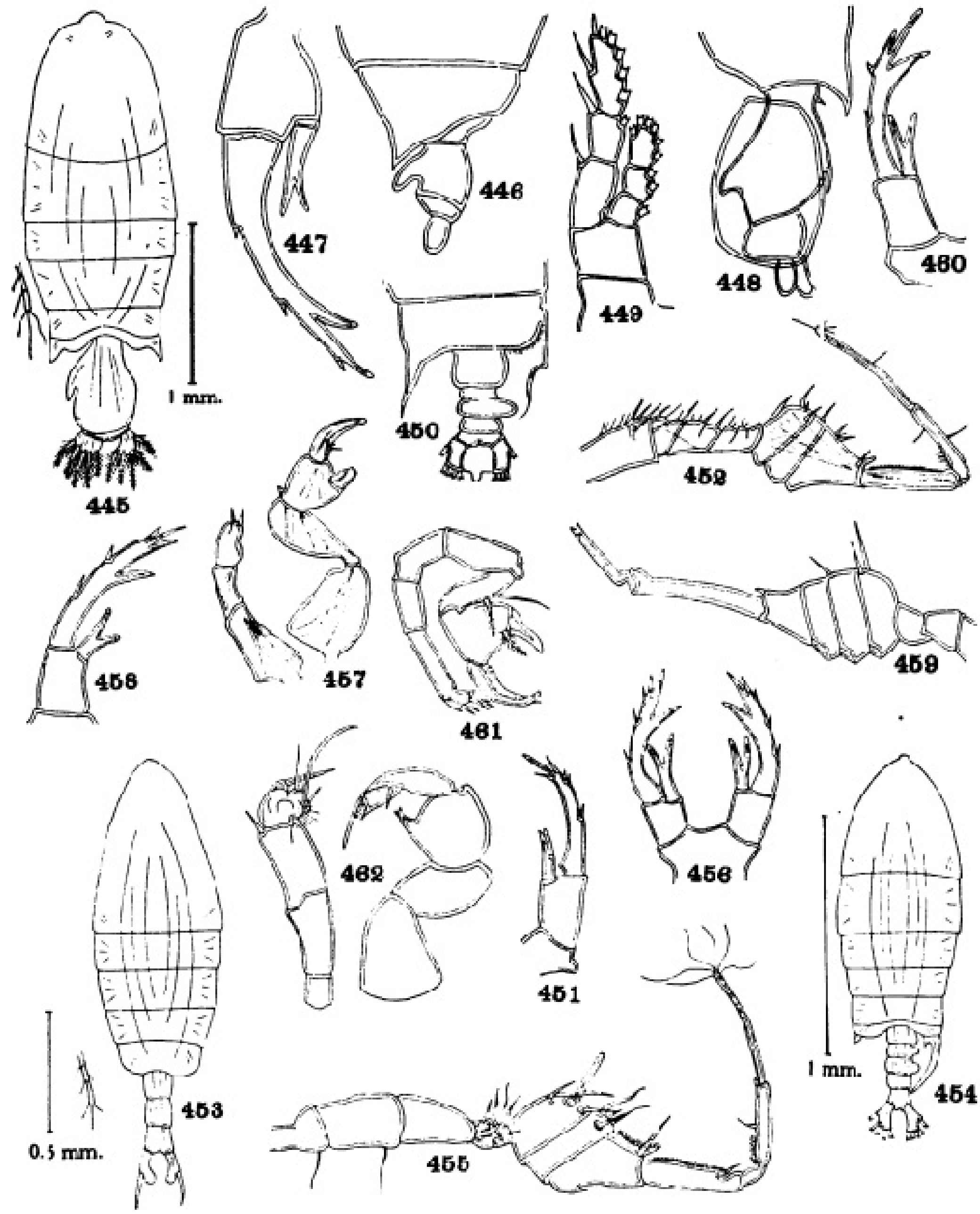
426–430, *Pontella surrecta*, new species: 426, Dorsal view; female; 427, urosome, lateral view, female; 428, dorsal view, male; 429, fifth legs, female; 430, fifth legs, male.

431, *Pontella tenuiremis* Giesbrecht, male: Fifth legs.

432, 433, 435–440, *Pontella valida* Dana, female: 432, Dorsal view; 433, urosome, dorsal view; 435, rostrum, lateral view; 436, rostrum, anterior view; 437, mandible; 438, first maxilla, posterior surface; 439, first maxilla, anterior surface; 440, fifth leg.

434, 441–443, *Pontella valida* Dana, male: 434, Dorsal view; 441, left fifth leg; 442, terminal detail of left fifth leg; 443, right fifth leg.

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SPECIES OF PONTELLOPSIS.

445–449, *Pontellopsis albatrossi*, new species, female: 445, Dorsal view; 446, urosome, viewed from left side; 447, fifth leg; 448, urosome, viewed from right side; 449, first legs.

450–452, *Pontellopsis armata* (Giesbrecht): 450, Urosome, dorsal view, male; 451, fifth leg, female; 452, right first antenna, male.

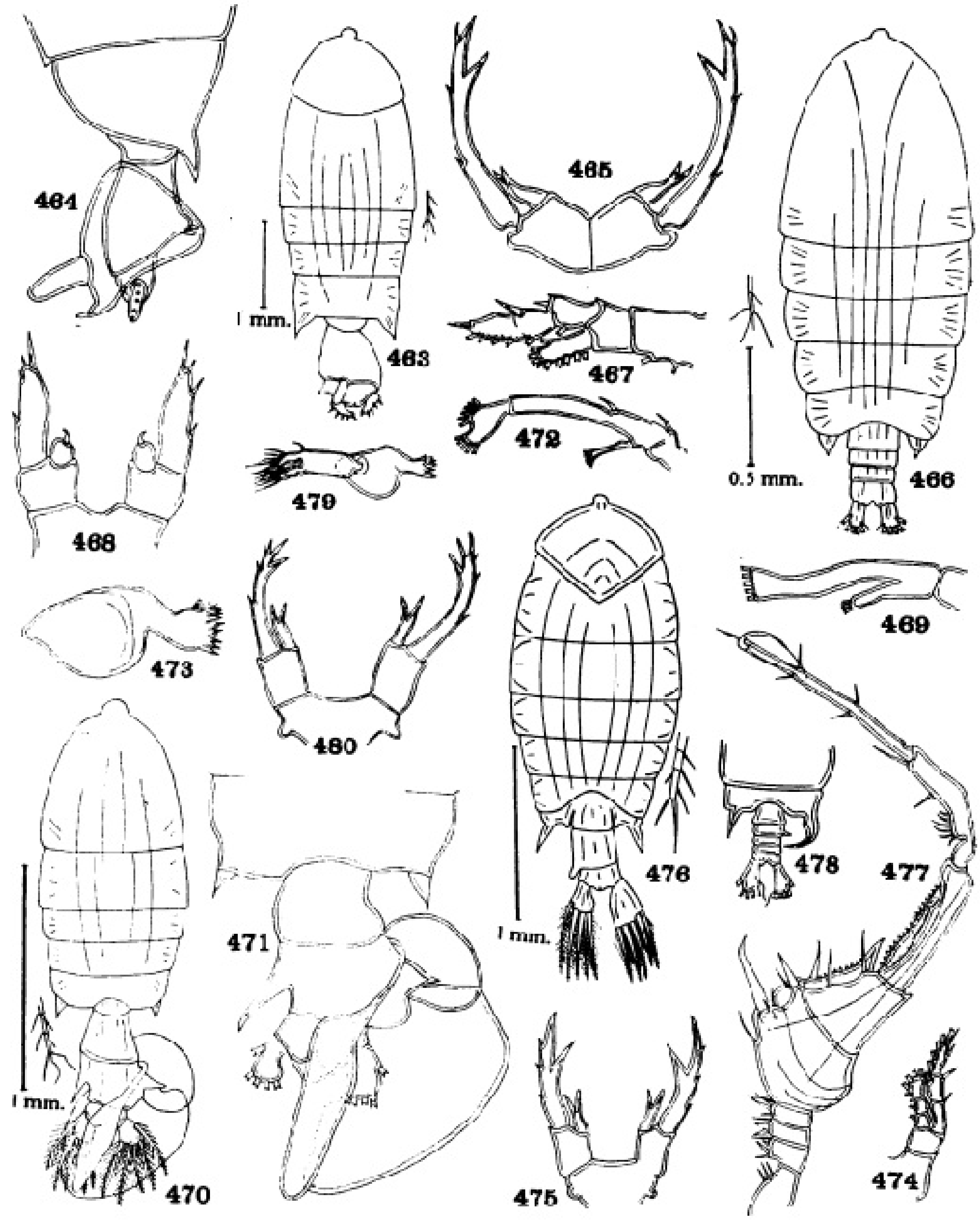
453–457, *Pontellopsis bitumida*, new species: 453, Dorsal view, female; 454, dorsal view, male; 455, right first antenna, male; 456, fifth legs, female; 457, fifth legs, male.

458, *Pontellopsis brevis*, female: Fifth leg.

459–461, *Pontellopsis lubbockii* (Giesbrecht): 459, right first antenna, male; 460, fifth leg, female; 461, fifth legs, male.

462, *Pontellopsis villosa* Brady, male: Fifth legs.

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SPECIES OF PONTELLOPSIS.

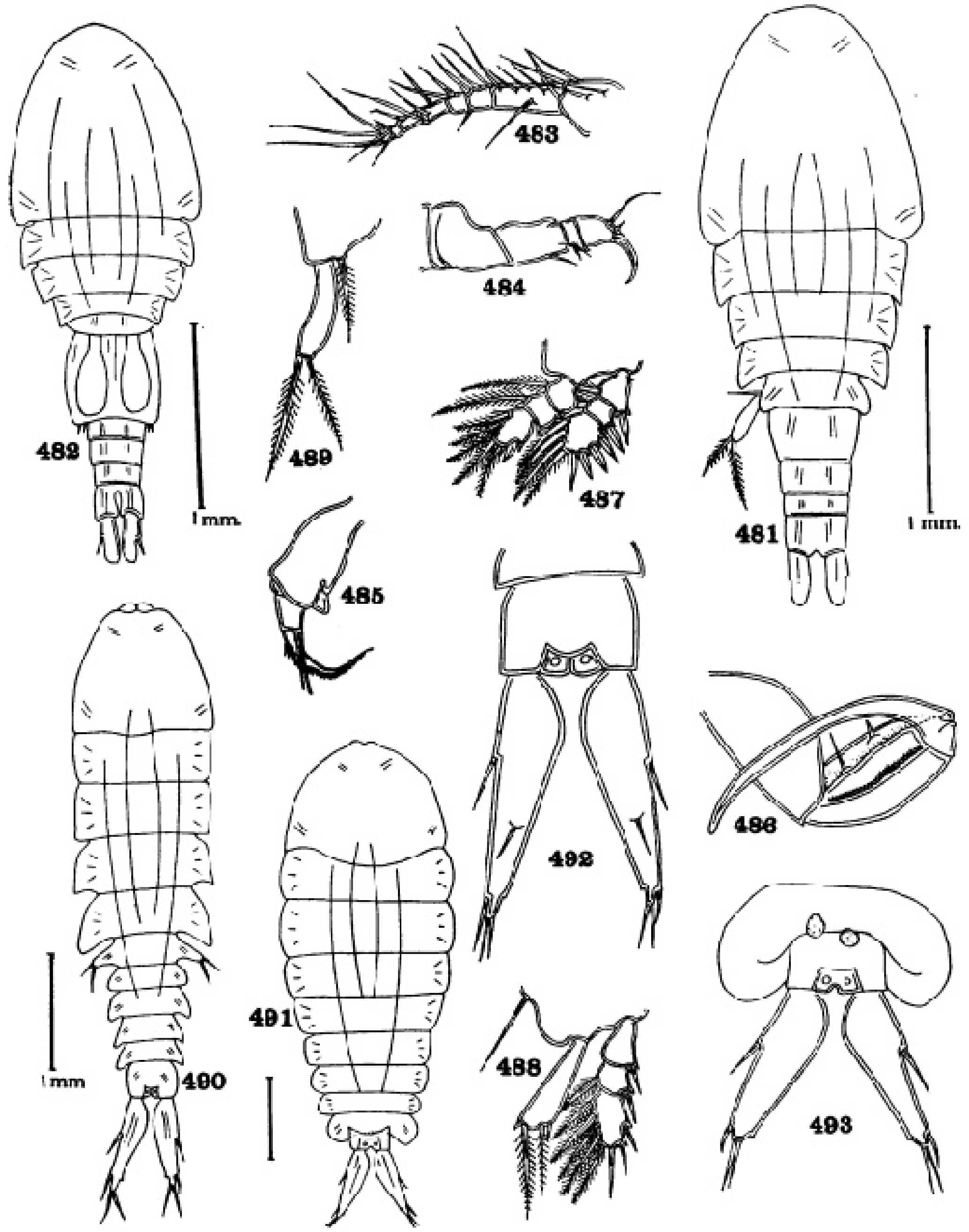
463–465, *Pontellopsis digitata*, new species, female: 463, Dorsal view; 464, urosome, lateral view; 465, fifth legs.

466–469, *Pontellopsis globosa*, new species, female: 466, Dorsal view; 467, first leg; 468, fifth legs; 469, second antenna.

470–475, *Pontellopsis laminata*, new species, female: 470, Dorsal view; 471, urosome, dorsal view; 472, second antenna; 473, masticatory base of mandible; 474, first leg; 475, fifth legs.

476–480, *Pontellopsis strenua* (Dana): 476, Dorsal view, female; 477, right first antenna, male; 478, urosome, dorsal view, male; 479, mandible, female; 480, fifth legs, female.

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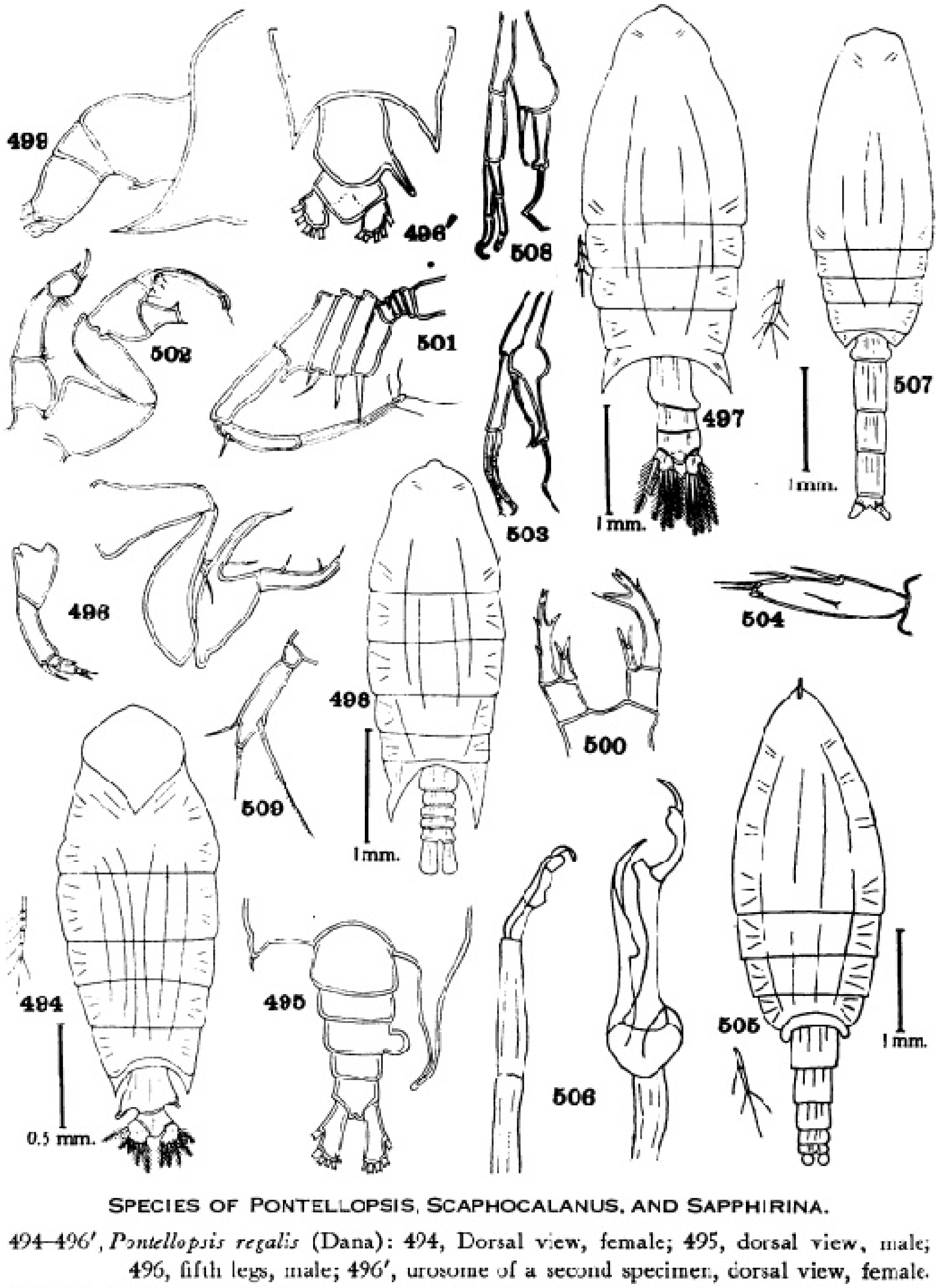
SPECIES OF PSEUDANTHESSIUS AND SAPPHIRINA.

481, 483, 484, 487, 488, *Pseudanthessius pacificus*, new species, female: 481, Dorsal view; 483, first antenna; 484, second antenna; 487, first leg; 488, fourth leg.

482, 485, 486, *Pseudanthessius pacificus*, new species, male: 482, Dorsal view; 485, second maxilla; 486, maxilliped.

490–493, *Sapphirina longifurca* A. Scott: 490, Dorsal view, female; 491, dorsal view, male; 492, caudal rami, female; 493, caudal rami, male.

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SPECIES OF PONTELLOPSIS, SCAPHOCALANUS, AND SAPPHIRINA.

494–496′, *Pontellopsis regalis* (Dana): 494, Dorsal view, female; 495, dorsal view, male; 496, fifth legs, male; 496′, urosome of a second specimen, dorsal view, female.

497–502, *Pontellopsis sinuata*, new species: 497, Dorsal view, female; 498, dorsal view, male; 499, urosome, lateral view, female; 500, fifth legs, female; 501, right first antenna, male; 502, fifth legs, male.

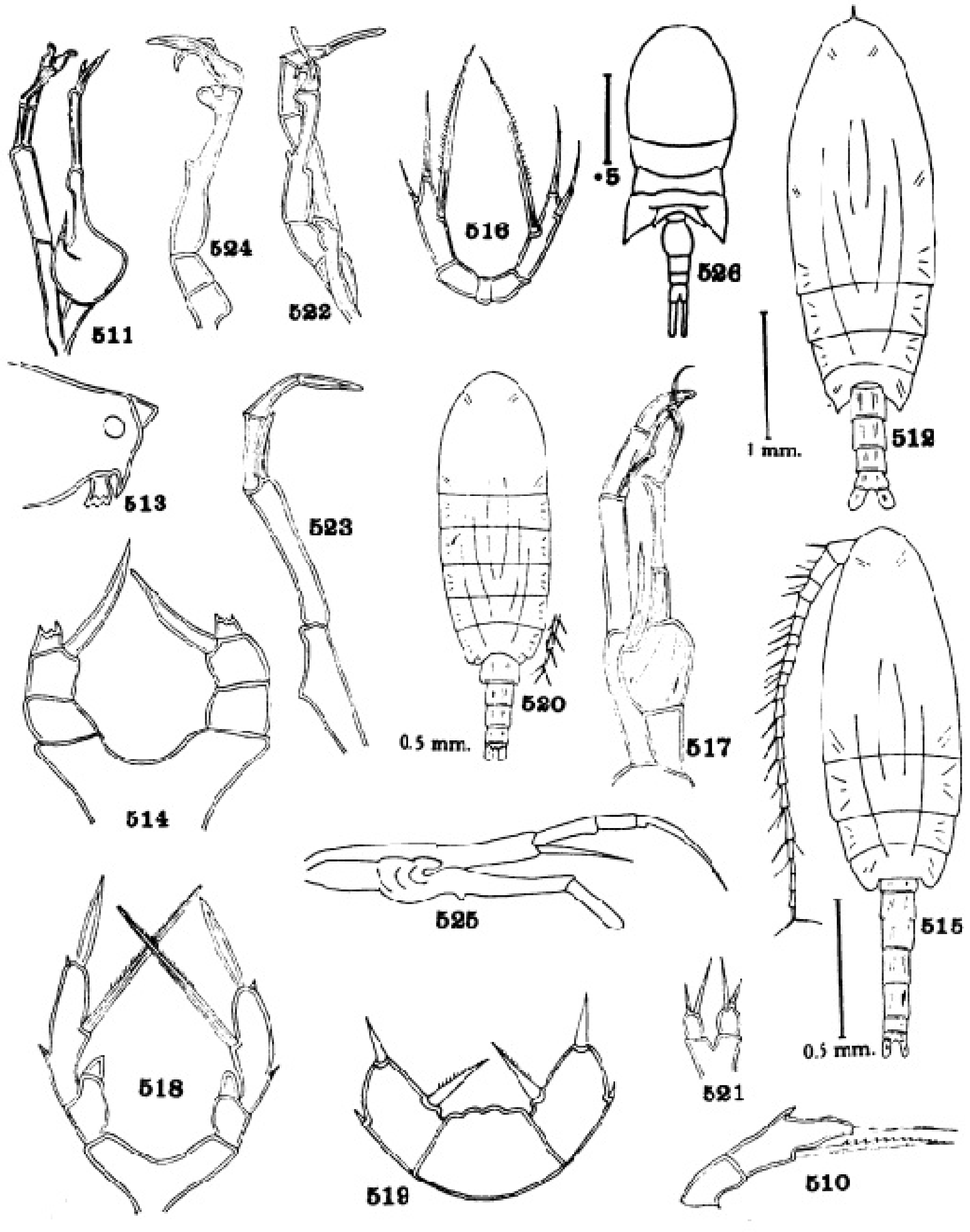
503, *Scaphocalanus affinis* (Sars), male: Fifth legs.

504, *Sapphirina lactens* Giesbrecht, female: Caudal ramus.

505, 506, *Scaphocalanus angulifrons* Sars, male; 505, Dorsal view; 506, fifth legs.

507–509, *Scaphocalanus brevicornis* (Sars); 507, Dorsal view, male; 508, fifth legs, male; 509, fifth leg, female.

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SPECIES OF SCAPHOCALANUS, SCOLECITHRICELLA, AND TEMORA.

510, 511, *Scaphocalanus echinatus* (Farran): 510, Fifth leg, female; 511, fifth legs, male.

512–514, *Scaphocalanus insolitus*, new species, female: 512, Dorsal view; 513, crest and rostrum, lateral view; 514, fifth legs.

515–517, *Scaphocalanus medius* (Sars): 515, Dorsal view, male; 516, fifth legs, female; 517, fifth legs, male.

518, *Scaphocalanus subbrevicornis* (Wolfenden), female: Fifth legs.

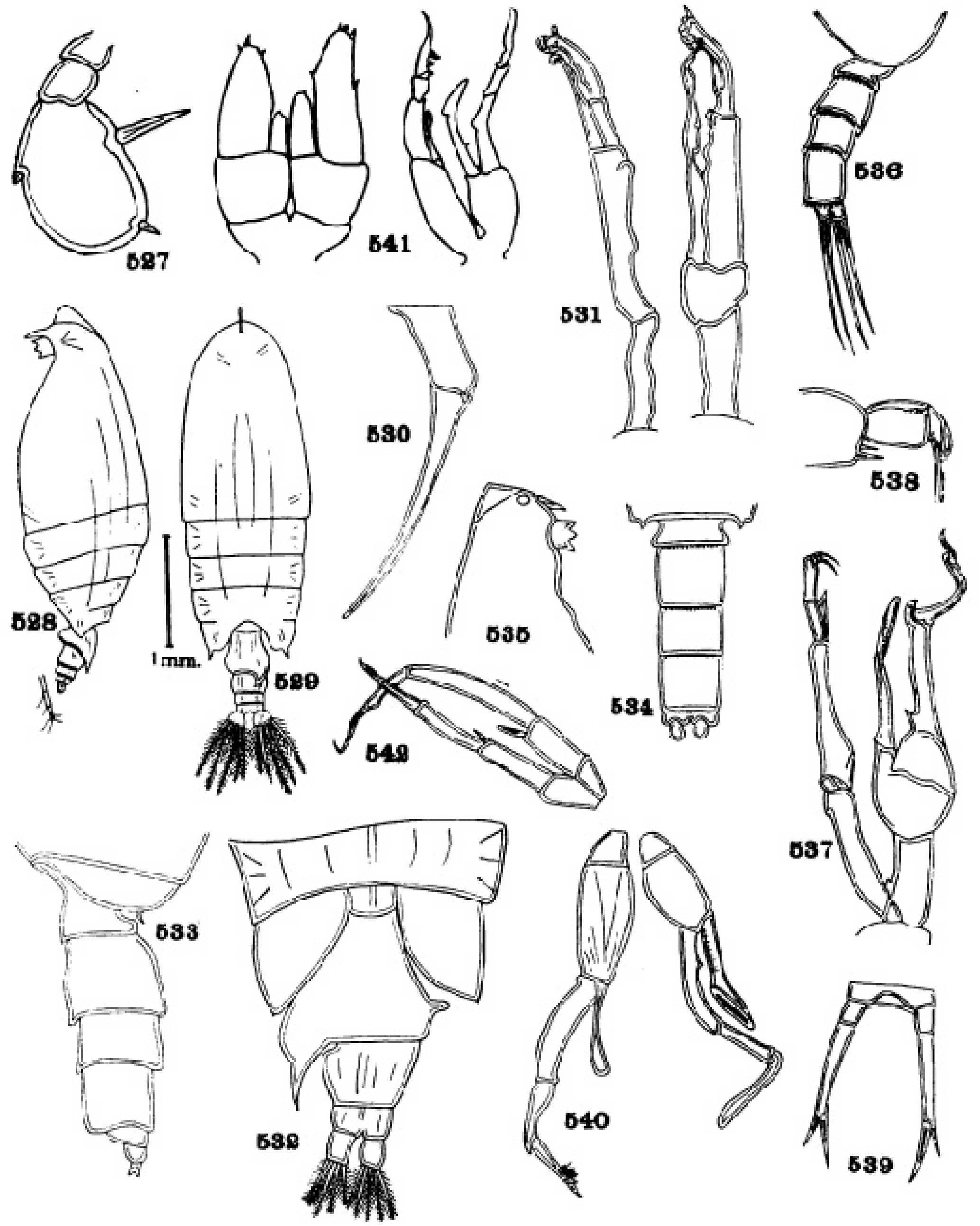
519, *Scolecithricella abyssalis* (Giesbrecht), female: Fifth legs.

520–524, *Scolecithricella auropecten* (Giesbrecht); 520, Dorsal view, male; 521, fifth legs, female; 522, fifth legs, male; 523, right fifth legs, male; 524, left fifth legs, male.

525, *Scolecithricella minor* (Brady), male: Fifth legs.

526, *Temora stylifera* (Dana), female: Dorsal view.

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SPECIES OF SCOLECITHRICELLA, PONTELLA, SCOTTOCALANUS, TEMORITES, UNDEUCHAETA, AND BRADYIDIUS.

527, *Scolecithricella ovata* (Farran), female: Fifth leg.

528–531, *Scolecocalanus spinifer*, new species: 528, Lateral view, female; 529, dorsal view, female; 530, left fifth leg, female; 531, fifth legs, male.

532, *Pontella pulvinata*, new species, female: Urosome, dorsal view.

533–537, *Scottocalanus farrani* A. Scott, male: 533, Urosome, lateral view; 534, urosome, dorsal view; 535, crest and rostrum; 536, urosome of another specimen; 537, fifth legs.

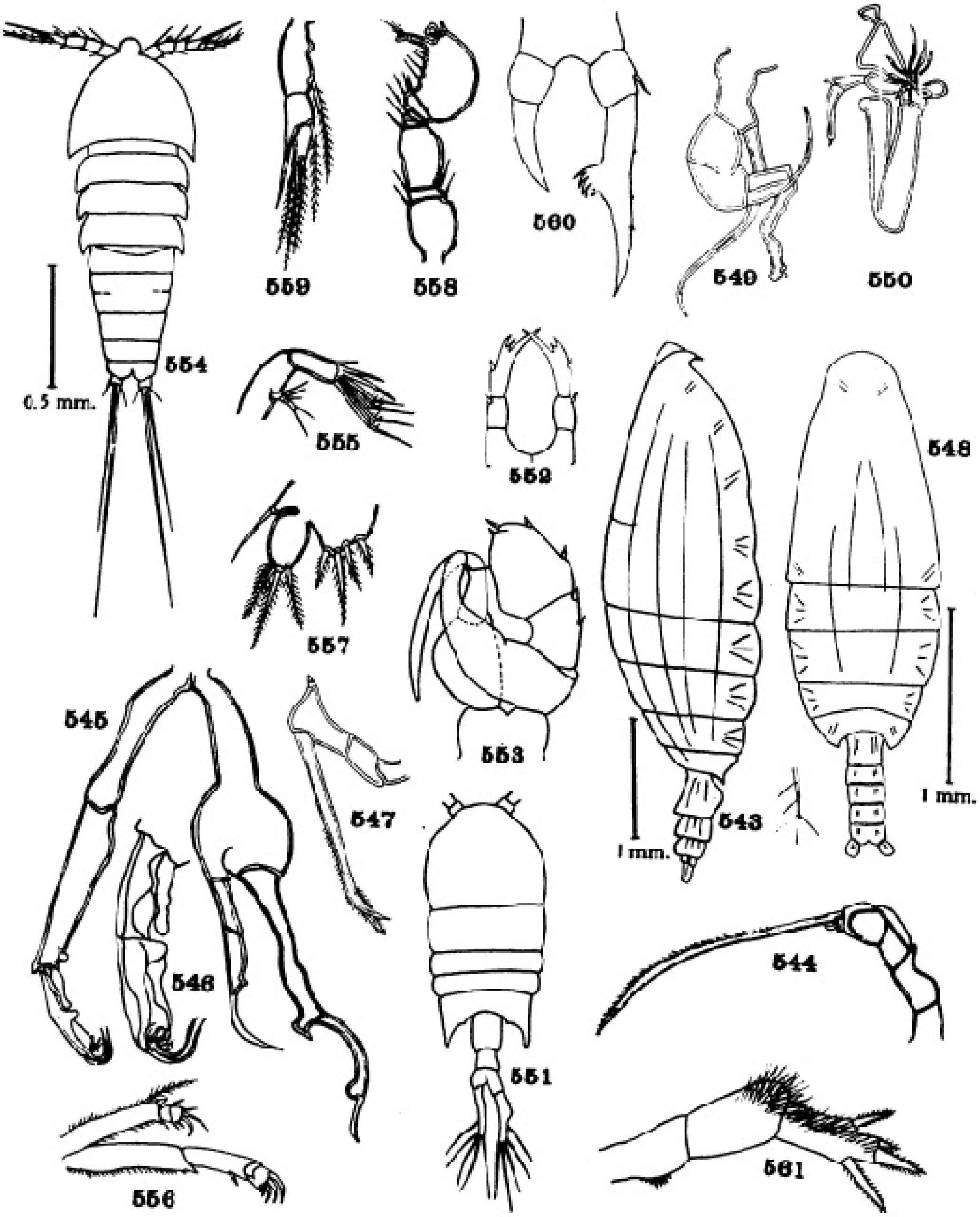
539, *Temorites brevis* Sars, female: Fifth legs.

540, *Undeuchaeta plumosa* (Lubbock), male: Fifth legs.

541, *Undeuchaeta major* Giesbrecht, males: Fifth legs of immature and mature examples.

542, *Bradyidius similis* (Sars), male: Fifth legs.

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SPECIES OF SCOTTOCALANUS, STEPHOS, TEMORA, TIGRIOPUS, TORTANUS, AND XANTHOCALANUS.

543–546, *Scottocalanus helenae* (Lubbock): 543, Lateral view, female; 544, fifth leg, female; 545, fifth legs, male; 546, exopod and endopod of left fifth leg, male.

547, *Scottocalanus thomasi* A. Scott, female: Fifth leg.

548–550, *Stephos perplexus*, new species, male: 548, Dorsal view; 549, left fifth leg; 550, right fifth leg.

551–553, *Temora discaudata* Giesbrecht: 551, Dorsal view, female; 552, fifth legs, female; 553, fifth legs, male.

554–559, *Tigriopus incertus* Smirnov: 554, Dorsal view, female; 555, second antenna, female; 556, first legs, female; 557, fifth legs, female; 558, first antenna, male; 559, endopod of second leg, male.

560, *Tortanus barbatus* (Brady), female: Fifth legs.

561, *Xanthocalanus pinguis* Farran, female: Fifth leg.

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